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The impact of nutrient rules on the value of farmland in the Selwyn-Waihora Water Management Zone, Canterbury

A Dissertation
Submitted in partial fulfilment
of the requirements for the
Degree of Master of Property Studies

at
Lincoln University
by
Edward Percy

Lincoln University
20 November 2015

Abstract of a Dissertation submitted in partial fulfilment of the
requirements for the Degree of Masters of Property Studies

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by

Edward Percy

Freshwater regulation is rolling out around New Zealand following the National Policy Statement for Freshwater Management 2011 and 2014 which introduced a framework for Regional Councils' to manage their respective freshwater resource. After community collaboration new rules are being progressively introduced at regional level to reduce freshwater pollution through a focus on nonpoint source nutrient leaching and runoff from farms. In Canterbury, nutrient management zones have been introduced. These zones create areas of differing environmental risk and set nitrate leaching limits for each respective zone. Further to this Canterbury has also created water management zones where zone committees collaboratively arrive at nutrient rules specific to their zone. This regulation potentially impacts on the productivity and conversely land value by constraining current management systems and farm inputs. Land value is closely linked to its productive capacity. This report endeavours to understand how this new wave of regulation is currently impacting on the land values in the Selwyn-Waihora Water Management Zone and what the perceived impacts are as the regulation comes into effect.

Keywords: nutrient regulation, Selwyn, land value, dairy, perception, nutrient rules

Acknowledgements

I would like firstly to acknowledge each of the eight interviewees who remain anonymous. All of the interviewees openly shared details about their landholding and dairy business together with acquiescently discussing the topic of how nutrient regulation is impacting their land value and business alike. I gained an immense amount of respect for their knowledge on the topic and their proactive attitude to addressing it within their respective businesses.

I would also like to thank Ruth Hodges of Colliers Rural Real Estate, and Ben Turner of Bayleys Real Estate for making the introductions for me. Their networks amongst the farmers of the Selwyn District is broad and valuable. I could not have amassed the calibre of interviewees without them.

Thank you to my wife Stephanie and son Tom who have endured this years' research on top of the past three years of extramural study. Without their patience and support I could not have achieved this research.

Thank you to Gary Garner. Gary has guided me for the last one and a half years in the world of research. I am surprised at the sense of achievement I have gained from this particular research. I'm not a natural academic, but with Gary's gentle prodding I have grown to appreciate the value of good research technique, design, structure and methodology. Thank you also to Jeff Heyl who has provided valuable guidance and enthusiasm to the method of research, and to Patrick Aldwell who is a person fervent about education and who passionately brainstorms on whatever topic I'm involved in, and shares his insight, literature and networks.

Finally thank you to the faculty of Land Based Commerce at Lincoln University. John McDonagh, Brent Nahkies, Rupert Tipples, Ian MacDonald, Gary Bridgman, Sandy Bond and Patricia McGaw who have all supervised my extramural study through the Master of Property Studies Executive Programme.

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Abbreviations

| | |
|------------|------------------------------------------------|
| Selwyn | Selwyn and Te Waihora/Lake Ellesmere catchment |
| LWRP | Canterbury Land and Water Regional Plan |
| SWWMZ | Selwyn Waihora Water Management Zone |
| ECAN | Environment Canterbury |
| RMA | Resource Management Act 1991 |
| NPSFW | National Policy Statement for Fresh Water |
| CLVMA | Cultural Landscape/Values Management Area |
| PSRA | Phosphorous Sediment Risk Area |
| CPW | Central Plains Water Limited |
| FEP | Farm Environment Plan |
| MGM | Matrix of Good Management |
| GMP | Good Management Practice |
| Ha | Hectares |
| NLE | Nitrogen Leaching Efficiency |
| Baseline N | Nitrogen Baseline |

Statement of Authenticity

I confirm that:

- This dissertation represents my own work;
- The contribution of any supervisors and others to the research and to the dissertation was consistent with normal supervisory practice;
- External contributions to the research (as defined in the House Rules) are acknowledged.

Candidate: Edward Percy

Date: 20 November 2015

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1 - Introduction

Farming is constantly looking at ways to produce more from a finite area of land. Irrigation can capacitate this with very good effect, especially in drier areas like Canterbury. But water quality is increasingly being scrutinised. The impact on rivers and lakes due to pollution through the likes of nitrogen leaching and phosphate runoff as a result of changing land use, irrigation schemes and a drive to increase productivity and profitability to remain economically competitive is impacting on our freshwater quality, our cultural values, and our habitats' health and diversity.

Environment Canterbury (ECAN), the regional council for the Canterbury region, has embarked on a course of regulation which places limitations on how farms operate by setting nutrient limits within several nutrient management zones. This research covers the Selwyn District which lies between the Waimakariri River to the northeast and the Rakaia River to the southwest, the Southern Alps to the northwest, and the Pacific Ocean and Lake Ellesmere to the southwest. Lake Ellesmere collects much of the water running off the Canterbury Plains before it runs into the Pacific Ocean and consequently is a collection area for nutrients leached and running off.

Most of the district has been classified within the nutrient allocation Red Zone where water quality outcomes are not met, with areas around Lake Ellesmere classified within a Cultural Area. From the Canterbury Water Management Strategy the Selwyn Waihora Zone Committee established a sub-regional chapter (Variation 1) of the Land and Water Plan for Canterbury. Variation now has legal effect.

The Matrix of Good Management (MGM) is to be publicised late 2015 for effect in 2017 with the impact of a 14% reduction of nitrogen leaching across the district including a 30% reduction of nitrogen losses from dairy farms and 7% from arable farms from 2022 for those farms emitting more than 15 kilograms of Nitrogen (N) per hectare per year (kgN/ha/yr). Unfortunately the MGM was not published prior to the beginning of the interview process, and is still delayed. The MGM will essentially dictate the nitrogen leaching limit each farm in Selwyn will need to be at by 2022 if they are still farming over 15 kgN/ha/yr at that point. This is an important part of policy in Variation 1 that is in farmers' minds but has not eventuated yet.

So the regulatory environment in which farmers operate in Selwyn is changing rapidly and will undergo considerable change in the future, especially around the rules coming into effect in 2017 and 2022.

Farms are bought and sold on their productive capacity. Production is the one factor farmers can have some control and influence over. Profitability is a reflection of productivity. This research investigates

how rules, which have the capacity to impact on productivity of farms, are impacting on land values and are perceived to impact on land values in the future.

1.1 Research Aim

This research aims to understand how stakeholders in dairy farmland in the Selwyn District are considering the nutrient regulation in Selwyn in relation to the value of their landholding and how regulation is impacting.

1.2 Research Objectives

The objective of this research is to gauge the impact of nutrient regulation on land values in Selwyn now and in the future by assembling the perceptions of eight dairy farmers in the district.

Farmers are the people making the decisions when it comes to land purchases, land sales and overall farm management. Within these decisions is an accumulation of knowledge and experience around nutrient regulation and a perception of how regulation will impact that land. They may be taking advice from various consultants and listening to the perceptions of public and professionals alike but their decision is their own, no matter how well informed or ill-informed, and it is this decision and the reasoning behind this decision that this research is looking to gather.

This research endeavours understand:

- How nutrient regulation is impacting on decisions dairy farmers have made with regard to a land transaction or management system.
- Whether farmers are taking action now to mitigate any perceived impact.
- How they perceive nutrient regulation has or will impact on their future use and/or disposal of their land.
- How it is impacting on land value.

2 - Literature Review

Land values rise and fall with the market but also rise and fall with the potential of the land to produce. Our forefathers put in a lot of hard work to clear the land and lift the productive capacity and value. Intensification of land use is the modern equivalent of our forefathers' transformation of the land's capacity but this is coming at a cost. The environment has been degraded. For example the intensification of dairy farms in New Zealand has been linked with increasing nutrient emissions to waterways (Cameron, Di, & Moir, 2013; G. J. Doole, 2010; Eisenhardt K.M., 1989; Petersen G.M., 2014). So rules are being introduced to regulate nutrient leaching/runoff from farms.

The aim of this literature review is to set the background for this research and summarise any literature that is relevant within the context of this research. This includes understanding why and how rural New Zealand is being regulated for nutrients and what that regulation looks like in Canterbury and within the Selwyn District. The literature also draws on overseas examples of nutrient regulation, examples of the impact of nutrient regulation on other regions around New Zealand, and analysis of the rural land market in Selwyn.

2.1 Intensification of Farming

Farmers from all industry sectors are experiencing pressure to intensify their operations and increase production (Small, Murphy-McIntosh, Waters, Tarbotton, & Botha, 2005). Small et al. (2005) found that the pressures for intensification were similar across dairy, sheep, beef and deer sectors and identified increasing land values and the need for return on investment as one of the top pressures along with alternative competing land uses, local and international product competition, and unstable or declining market prices/rising NZ dollar. However, in this study it was found that all farmers, across each sector expressed concern about some potential effects of intensification such as negative environmental impacts. The three top drivers for intensification by dairy farmers in the Waikato were declining market prices, the need for increased profitability and productivity and the increasing capital value of land (Small et al., 2005).

Agricultural pressures on the land are driven largely by economics and have fluctuated with export prices and past government subsidies. High market prices caused farmers to convert forest to pasture during the 1950s wool boom, and government subsidies for pastoral farming had the same effect in the 1970s and early 1980s. Since the incentives ended in the mid-1980s, sheep numbers have declined and several thousand hectares of pasture has been converted to exotic pine forests. An even larger area of marginal

pasture on steep erodible slopes has been left to regenerate in scrub and native forest (MOE, 1997). Dairy farming is the main driver of recent farming intensification. Between 2002 and 2012, the area of dairy farming in New Zealand increased 28 percent and dairy farm areas in Canterbury, Otago and Southland doubled between 2002 and 2012 (MOE, 2015). The number of dairy cows in the South Island, between 1990 and 2010 increased seven-fold (Joy M., 2015).

Farming intensification also affects land productivity through compaction of soils reducing the ability for pasture to grow and the capacity of soils to hold water, resulting in greater run-off (MOE, 2015). While increased use of nitrogen fertilisers and higher stocking rates can increase production, nutrient leaching and runoff can degrade the ecological health of fresh water (MOE, 2015). Nitrate leaching has been an issue for some decades in New Zealand, but has grown in significance as farming intensified in many parts of the country.

2.2 Impacts on Farming

There is some recognisable scepticism in the public around the quality of the science that is not presented on water quality and how that directly reflects on farmers. Also on how nutrient regulation will impact on farm business productivity and profitability.

At Lincoln University the Lincoln University Dairy Farm (LUDF) had the strategic objective between the 2011/12 to 2013/14 seasons to move into 'Precision Dairying' which included higher productivity and higher profitability from a similar environmental impact. After the temporary suspension of Eco-n (DCD) in 2013 in the attempt to hold nitrogen losses without the mitigation effect of Eco-n the farm had to cull its surplus cows early in Autumn 2014 to meet the farms N-loss target. This was at a cost of \$84,000 loss in profit (LUDF, Feb 2015, July 2015). In 2014/15 LUDF has adopted a 'Nil-Infrastructure, low input' farm system in response to tightening environmental requirements and to meet its historical N-loss. LUDF has identified that profitability of the nil-infrastructure, low input system is very dependent on milk production (LUDF, Feb 2015, July 2015). The LUDF (Feb 2015) report has a 'sensitivity of profit to production' table showing:

'A 5% drop in production will result in 25% decrease in operating profit while a 10% decrease in production will drop operating profit by 50% (at the current forecast payout)' (LUDF, Feb 2015).

The reported loss in profit of \$84,000 has been written in magazines and heard in seminars to highlight what the potential impact of maintaining current nitrogen leaching levels could be on profit. McBride Dr R. (Sept 2015) quoted a statement made at the Fertiliser and Lime Research Centre Workshop at Massey

University that, after mentioning the loss in profit at LUDF - "if every dairy farm did the same the loss would be a billion dollars a year". McBride Dr R. (Sept 2015) also casts doubt on the validity of water quality science, or at least the water quality science fraternity being able to back up their broad statement that water quality is poor, with science.

2.3 Impacts on the Environment

Since the arrival of Europeans in New Zealand 90 per cent of wetlands have been drained and the removal or alteration of a similar amount of indigenous vegetation covers has occurred (Joy M., 2015). This is putting pressure on the health of freshwater in New Zealand. More recent intensification of farming has exacerbated this.

Between 1990 and 2012, the estimated amount of nitrogen that leached into soil from agriculture increased 29%, which was mainly due to increases in dairy cattle numbers and nitrogen fertiliser. Total nitrogen levels in rivers increased 12%, with 60% of monitored sites showing statistically significant increases (Agletter, Oct 2015; MOE, 2015).

The threat to our ecosystem is real. 80 percent of resident bird species, 88 percent of reptiles and 100 percent of frog species face extinction (Mitchell C. Cooke H., 2015; MOE, 2015). 74 percent of the native freshwater fish species are listed as threatened, and 90 percent of monitored lowland waterways and 62 percent of all waterways are failing bathing standards (Joy M., 2015).

New Zealand now has proportionally more threatened freshwater fish species than almost any country globally, as noted by the International Union of Conservation of Nature (IUCN) in 2010 (Joy M., 2015).

Lake Ellesmere stands in the way of surface and groundwater draining from the Southern Alps, across the Canterbury Plains. The Selwyn River drains the central Canterbury foothills, flowing about 60 km across the Canterbury Plains before entering Lake Ellesmere (Kelly D. Davey A. James G., 2006). A study (2010) by the National Institute of Water and Atmospheric Research named Ellesmere as the most polluted of 140 lakes (Williams D., 2011).

2.4 Types of Regulation

There has been considerable research into methods of regulating nutrient pollution.

Graeme J. Doole and Romera (2014b) assessed the use of Nitrogen Leaching Efficiency (NLE) as a method for use in a regulatory scheme. NLE is defined as the ratio of kilograms of milk solids produced to kilograms of N leached. They found that the coarse relationship between N leaching and NLE infers that N leaching could easily increase under a policy that targets NLE, highlighting the general inadequacy of efficiency measurements for environmental regulation.

Restrictions placed directly on livestock intensity and/or N fertiliser application have been shown to be broadly ineffective, as they do not directly target the relationship between production and nutrient losses in New Zealand dairy systems (G. J. Doole, 2010).

By comparison, restrictions placed directly on N leaching levels are effective in reducing losses, since they directly target estimated levels of nutrient outflows and thus incentivise the use of mitigation technologies (Graeme J. Doole & Romera, 2014b). However the costs to farmers can be high, depending on farm characteristics and the degree of reduction sought (Graeme J. Doole, 2012).

An alternative incentivised method is possible whereby nitrogen efficiency is measured and the most efficient are rewarded and the least efficient are penalised (Joy M., 2015). Milk companies could pay a premium to the most efficient and regional councils could give rates reductions to these farmers too (Joy M., 2015).

Joy M. (2015) believes there needs to be some kind of cost in the form of a charge on polluters, or pay a premium on nitrogen efficiency, otherwise New Zealand is incentivising pollution.

Farmers are motivated by a diverse range of drivers and constrained (and enabled) by a range of social, cultural, economic and physical factors. Farmers will therefore react in different ways to external drivers of change and will respond differently to encouragement, incentives and legislation aimed at influencing their farming practices.

Restricting N leaching levels as a charge on polluters is proving a popular method of regulation amongst New Zealand regional councils, most particularly Canterbury and the Selwyn District. The computer modelling programme Overseer is being used within regulatory frameworks to set nutrient limits and measure farm systems in order to regulate.

2.5 Modelling Nutrient Limits

Nutrient limits set within the LWRP and Variation 1 are set on the basis of Overseer. Overseer is a computer programme which models a farm system. By entering all relevant climatic, physical and operational inputs it generates a measure of that farms nutrient leaching and runoff.

Overseer is jointly owned by the New Zealand Ministry for Primary Industries (MPI), the Fertiliser Association of New Zealand (FANZ) and AgResearch Limited and is a strategic management tool that supports optimal nutrient use on farm for increased profitability and managing within environmental limits (Overseer, 2015b).

Overseer provides a nutrient budget which indicates the long-term sustainability of a farm system by indicating where fertiliser applications are inadequate, leading to a decline in soil nutrient status, and conversely indicate where there are excessive inputs which create nutrient surpluses and greater potential for losses to the environment (Ledgard S F., 2014; Shepherd M., 2014).

2.6 How is Farm Productivity Linked to Land Value

Land value is arrived at through free market transactions where there is a willing buyer and a willing seller (Jefferies R.L., 1991). It is the productivity of rural land, or the ability for that land to generate a return on capital, which impacts on a buyer's calculation of worth to him.

The single most important factor contributing to the value of farm land is its immediate production expectations (Frizzell R, 1979). A purchaser will base a decision to buy on the potential productivity of the land and be prepared to offer an amount for the land which will maximise the gross margin or return from that activity (Baxter J.S. Cohen R.K., 2009).

Largely farms in Canterbury and around New Zealand are being sold on a dollar amount per hectare as a measure of their market value. As a secondary measure the sale price is analysed on a productive basis i.e. \$/kilogram milk solid or \$/stock unit. What purchasers will pay for a block of land does largely depend on its productive capacity. Budgets are conducted by the purchaser and their lenders to quantify the ability of that land to return the required rate of return. Each purchaser has a different required return relative to their level of lending and desired profit. Invariably the market assesses what a piece of land can produce under average efficient management to ascertain the market value. Some purchasers, like neighbouring landowners, will factor a premium for land given that it adjoins the boundary of their land as there are economies that can be gained by this proximity.

There are pressures on farmers around New Zealand to engage in the opportunities that changing land use has provided to remain profitable and to ensure the ongoing future of their families on the land (Copland, Stevens, & Nzga, 2012). The ability for dryland farmers in Canterbury to change their land use to remain profitable in the wake of nutrient regulation is in question. Also in question is the viability of existing land uses once the new rules are put in place.

2.7 International Examples of the Impact of Regulation on Farm Productivity

There has been research undertaken in Australia and Switzerland on the impact of regulation on farm productivity.

Research in Australia found that there are challenges to farmers of government programs and policies that have attempted to increase farmer awareness of environmental issues, increasing budgets for rural environmental programs, increasing environmental regulation, and purchasing water from friendly practices (Pannell, 2011). The challenges related to maintaining farm productivity, meeting community expectations, living with less water and evaluation of new opportunities. Pannell (2011) concluded that while there were challenges, they are not insurmountable.

Switzerland was among the first western European countries to introduce environmental regulations for agricultural production (Bokusheva, Kumbhakar, & Lehmann, 2012). Bokusheva et al., had the objective of analysing the impact of policy reforms (compliance of environmental regulation) implemented from 1991 to 2006 on the productivity of Swiss Farms. The Swiss Ag Policy since 1992 has ultimately been to make supplementary payments to farmers contingent on compliance with ecological regulation. It was found that farmers began to look for technological options for maintaining high productivity of input use not by increasing input intensity, but rather the effectiveness of input utilisation (Bokusheva et al., 2012).

Another study conducted in Switzerland was to test the Porter hypothesis. The Porter hypothesis is that strict environmental regulations do not inevitably hinder competitive advantage against foreign rivals, they often enhance it (Porter 1991, p. 162 cited in (Ferjani, 2011)). Porter suggested that more severe environmental regulation may have a positive effect on farms' productivity by stimulating innovations i.e. faced with the prospect of higher abatement costs, farms will invest in innovation activities to find new ways to meet new regulatory requirements. Findings were mixed but did not seem to reject it (Ferjani, 2011).

In New Zealand, research conducted by Graeme J. Doole and Romera (2014a) found that the method of restricting mean N leaching rates directly promotes the use of mitigation practices to reduce abatement costs.

2.8 Where Nutrient Regulation Comes From in New Zealand

The Resource Management Act 1991 (RMA) is the main piece of legislation in New Zealand used to look after the environment. Its core objective is 'sustainable management' of New Zealand's resources. It puts the concept of keeping New Zealand's environment pristine in the hands of local communities who communicate their ideals to local councils who in-turn manage it.

There are 12 regional councils, 68 city and district councils and 5 unitary councils in New Zealand legislated by the RMA.

The RMA requires every regional council to prepare a regional policy statement which is designed to achieve the purpose by providing an overview of the resource management issues for the region, and stating the policies and methods required to achieve the integrated management of the region's natural and physical resources (section 59, RMA 1991).

On occasion central government will issue a National Policy Statement under the RMA on matters of national significance. Most recently and significantly the New Zealand Government issued the National Policy Statement for Freshwater Management 2011 and subsequently 2014 (NPSFW2014).

The NPSFW2014 was updated in 2014 to incorporate the 'National Objectives Framework'. The National Objectives Framework provides a standard list of possible values for which a particular freshwater body could be managed, such as swimming, fishing or irrigation. 'While the actual values chosen for each freshwater body would be a local decision, the minimum states that apply to those values will be set at a national level through the framework. The framework incorporates the consideration of tangata whenua values, consistent with the Mana Atua Mana Tangata Framework' (MFE, 2014).

The NPSFW 2014 is the major driver for regional councils to update their regional policy statements and regional plans. It directs regional councils to consider specific matters about fresh water when they are developing regional plans for fresh water (NPSFW, Aug 2014).

2.9 National Policy Statement for Freshwater Management 2014

Regional councils must set objectives, policies and rules about freshwater in their regional plans by first establishing freshwater areas (freshwater management units) across their region and identifying the values that communities hold for the water in those areas. Next, councils are required to gather water quality and quantity information on the water bodies to assess their current state and decide the water quality objective or goal (grouped into A, B or C Bands) for each value the community has chosen based on the economic, social, cultural and environmental impact to that community. The final step is for the community to assess how, and over what timeframe, those goals are to be met (NPSFW, Aug 2014).

In order for this process to work, the NPSFM2014 now requires councils to account for all water taken out of rivers, lakes and groundwater, and the sources and amounts of contaminants going into them. This will provide councils and their communities with the necessary information to understand the impacts of freshwater objectives before they are set in the regional plan (NPSFW, Aug 2014).

"Ecosystem health" and "human health for recreation" are compulsory national values and must be provided for everywhere. The NPS now includes nationally-set minimum acceptable states for these two values which are called National Bottom Lines (NPSFW, Aug 2014).

2.10 The Canterbury Landscape

Canterbury is the largest region by area in New Zealand, has 12.7% of the country's population (539,436) and is the 2nd most populated (Wiki, 2015). The region is bound by the Conway River to the north, the Southern Alps to the west, the Waitaki River to the south and the Pacific Ocean to the east. The Canterbury Plains predominate.

Climatically August and February are the driest months in Canterbury and typically it has hot dry summers and crisp winters. The prevailing winds in Canterbury are a warm and dry northwesterly and a colder wetter southeasterly.

These climatic conditions provide reasonably reliable pasture growth from early spring through to mid to late summer and in early autumn seasons, however prolonged summer drought conditions, which severely restrict pasture growth, are expected once every 5 to 6 years. There has been considerable



Figure 1: Canterbury Region - Source: Wikipedia

irrigation development in Canterbury in recent times which largely mitigates drought influence making this region, with irrigation, a good climate for arable and pastoral farming.

2.11 Canterbury Land & Water Regional Plan

As of 1 September 2015 the Land and Water Regional Plan (LWRP) was made operative, in part. The parts of the plan not operative are those subject to unresolved appeals to the High Court (LWRP, Aug 2015). For example; Take and Use of Surface Water (Rule 5.123-5.127) and Dams & Damming (Rules 5.154-5.158).

The LWRP takes the place of the Canterbury Natural Resources Regional Plan.

Environment Canterbury's Land & Water Regional Plan provides the regulatory framework to implement the communities aspirations for water management under the Canterbury Water Management Strategy (ECAN, 2014a).

The rules in the LWRP pertaining to nutrients (rules 5.41 to 5.64) take into account the water quality within an area (its 'nutrient allocation zone'), and the amount of nutrient leached by a farming activity, and regulates nitrate leaching accordingly (What Does It Mean, 2014). Canterbury has been categorised into Nutrient Allocation Zones. The red zones, for example, are areas where water quality outcomes are not being met; orange zones are where there is a risk of water quality outcomes not being met; and green or blue zones are where water quality outcomes are presently being met (What Does It Mean, 2014).

Canterbury has been broken into ten water management zones. Zone Management Committees co-ordinate the development of the Zone Implementation Programme, and a Regional Water Management Committee handle issues common across the region (Canterbury Water, 2009).

There is an overview of the LWRP nutrient management specific nutrient zone rules for Canterbury in Appendix A (appended). Additional to these zone rules are rules relating to land with access to water from irrigation schemes, rules specific to large farm enterprises, and the implications of the introduction of the Matrix of Good Management as follows:

2.11.1 Irrigation Scheme

Rule 5.60 of the LWRP covers farms with irrigation from an irrigation scheme, such as Central Plains Water Limited (CPWL) in Selwyn, making them a permitted activity as follows:

The use of land for a farming activity is a permitted activity, provided the property is irrigated with water from an irrigation scheme or a principal water supplier, and the irrigation scheme or a principal water supplier holds a discharge permit that specifies the maximum annual amount of nitrate-nitrogen that may be discharged or leached (ECAN LWRP, Sept 2015).

CPWL are sublicensing the nitrogen allocation to new irrigators based on an assessment of the difference between their existing 2009-2013 dryland nitrogen baseline for their farming system and the nitrogen loss model for the proposed irrigated farming system within the limits of MGM (CPWL, 2015b). CPW has a nitrogen allocation of 979 tonnes across their catchment which is an average of 36.2kgN/ha/yr under OVERSEER 6.1.3 and which has been included in Variation 1 for CPWL dryland (CPWL, 2015a). By entering the CPW scheme farms will come under the CPW discharge consent and CPW will be required to manage FEP implementation, audits and annual reporting to ECAN, and also manage reductions to meet regulatory requirements from 2022 (CPWL, 2015a).

2.11.2 Farming Enterprise

Farms in Canterbury can form a farming enterprise which groups all farms owned by one entity into one for nutrient management. This is comprised in Rule 5.46 as follows:

The use of land for a farming activity as part of a farming enterprise is a discretionary activity, provided a Farm Environment Plan has been prepared in accordance with Schedule 7 Part A and the nitrogen loss calculation for the farming enterprise does not increase above the nitrogen baseline, and the properties comprising the farming enterprise are in the same surface water catchment and Nutrient Allocation Zone, as shown on the Planning Maps. (ECAN LWRP, Sept 2015).

Farming enterprises are also covered in Variation 1 under section 11.4.15A (1) as follows:

Enable establishment of farming enterprises in circumstances where, for the purposes of nutrient management, the total farming activity does not exceed the aggregate of the nitrogen baseline of all the parcels of land used in the enterprise (whether or not the parcels are held in single, multiple, or common ownership) (ECAN V1 Decision, Apr 2015).

2.11.3 Matrix of Good Management

The Matrix of Good Management (MGM) is a significant tool being developed this year to underpin the nutrient rules in the future. It is currently being developed as a joint initiative, based on a consensus approach between Environment Canterbury, key primary sector organisations, CRI scientists and farmers (ECAN, 2013). Its development and rollout timeline is as follows:

- In 2015 it is designed to deliver a matrix of nitrogen and phosphorous losses under agreed GMPs for various sectors (dairy, sheep/beef/deer, arable, horticulture and outdoor pigs) across a range of soils and climates.
- Between 2015 and 2017 it will be built on to develop a database to assist implementing the MGM as a tool to assess compliance throughout Canterbury, taking into account changes in farm management practices and improvements in science (ECAN, 2013).

The matrix will clearly identify expected nutrient losses under GMP. These expected losses will form benchmarks for farmers (ECAN, 2013).

Under policy 11.4.14 in Variation 1 of the LWRP there is a requirement for farmers to be at a nitrogen loss of at least halfway between maximum feasible mitigation and Good Management Practice (GMP). The MGM is to be used to quantify GMP for a particular farming system, soil type and climate.

The 'maximum feasible mitigation' means the largest reduction in nutrient losses that a farm system can achieve without changing land use given the current technology it is using, as defined in the Technical Overview Report (R14/15, page 14) (ECAN V1, July 2015).

The Central Plains Water scheme is already consented, but will move to an overall nitrogen load limit that requires new irrigated land to operate at the 2022 nitrogen loss rates immediately (Variation 1, Feb 2014).

2.12 Selwyn District

Canterbury has been broken into ten water management zones of which the Selwyn-Waihora zone is one. Zone Management Committees co-ordinate the development of the zone implementation programme (Water Management Strategy, Nov 2009). The Selwyn-Waihora Zone Water Management Committee is responsible for submission of the zone implementation programme for the Selwyn catchment to regional council.

Variation 1 is the first change to the proposed Canterbury Land and Water Regional Plan related to a specific area (the catchment of Te Waihora/Lake Ellesmere).

2.12.1 Variation 1 (Plan Change 1)

Variation 1 was pulled together by the Selwyn-Waihora Water Management Committee after extensive collaboration with stakeholders and community. It now has legal effect being the first change to the proposed Canterbury Land and Water Regional Plan related to a specific area, putting in place policies

and rules to help achieve the community goals for freshwater that have been set under the collaborative Canterbury Water Management Strategy (ECAN, 2014b).

The challenges in the Selwyn catchment include over allocation of water, water quality where there are nutrient losses in the catchment collecting in Lake Ellesmere, together with the cultural significance of Lake Ellesmere (ECAN, 2015).

On the 23rd of April 2015 Environment Canterbury accepted the recommendations of independent hearing commissioners on the proposed Variation 1. Variation 1 rules, in sections 11.5.1 to 11.5.45, are yet to be inserted into the LWRP Section 11 through Plan Change 1, but now have legal effect.

Very broadly Variation 1 prescribes the following:

- From 2014 farmers with nitrogen losses greater than 15 kg N/ha/yr will have to achieve good management practice nitrogen loss rates for their existing (2009-13 baseline) land use (ECAN, 2014b).
- From 2017 additional rules will apply requiring farmers to meet the leaching rates detailed within the yet to be published Matrix of Good Management (MGM).
- From 2022, all farms with losses of more than 15 kg N/ha/yr will need to further reduce nitrogen losses (ranging from 30% for dairy to 7% for arable) (ECAN, 2014b).

It starts with farmers operating at good management practice for all activities, additional rules will apply from 2017 depending on nitrogen leaching rates (Variation 1, Feb 2014).

There were a few key features that came out of the independent hearing commissioners report of 23 April 2015 as follows (ECAN, 2015):

- Farmers will be required to reduce their nutrient losses. The timetable for this allows them to make improvements to their nutrient management while maintaining farm financial viability. Where nitrogen loss rates are more than 15 kgN/ha/yr, from 2022 farming activities must significantly reduce their nitrogen losses - by an average of 14%.
- A nitrogen loss allocation is available for the dryland that will be irrigated by the Central Plains Water irrigation scheme.
- The role of drains in contributing nutrients, sediment and microbial contaminants to waterways and the lake is recognised, with stock access prohibition extended to drains.
- To help address water quantity issues, water allocation limits are set, new takes are prohibited and the transfer of water permits is restricted. New minimum flow restrictions on streams and rivers are introduced from 2025.

- A prohibition on new damming extends to the Waianiwaniwa River and its tributaries and the north branch of the Selwyn River.

A presentation held at Lincoln University by Ian Lyttle representing ECAN in April 2015 provided the regulatory bodies insight into what was ahead. There is likely to be greater sensitivity in the OVERSEER programme, greater use of Farm Environment Plans and more auditing of these plans, increased reliance on irrigation companies, more industry extension programmes and stronger networks where farmers team up to manage their N losses. Broadly they are encouraging farmers to mitigate the impact of regulation on their businesses in order to adhere to the rules.

Now that the Land and Water Regional Plan has in part been made operative any activity carried out in Selwyn; where the sub regional plan has been notified, the activity must be assessed against the operative plan and the proposed plan (LWRP, Aug 2015). The most restrictive activity classification applies (LWRP, Aug 2015).

Good Management Practice (GMP) is a key policy within Variation 1. A 14% reduction in nitrogen losses across the catchment beyond those that could be reasonably anticipated by adopting good management practices are expected by 1 January 2022 by requiring farming activities to:

(a) Implement a Farm Environment Plan prepared in accordance with Schedule 7 Part A, where a property is greater than 10 hectares; and

(b) Where a property's nitrogen loss calculation is greater than 15 kgN/ha/yr, further reduce losses of nitrogen by implementing management practices that are at least half-way between good management practice and maximum feasible mitigation, which means the required reduction in the losses of nitrogen for each farming sector are likely to be in the order of:

- 30% for dairy; or
- 22% for dairy support; or
- 20% for pigs; or
- 5% for irrigated sheep, beef or deer; or
- 2% for dryland sheep and beef; or
- 7% for arable; or
- 5% for fruit, viticulture or vegetables; or
- 0% for any other land use.

As mentioned above in 'Matrix of Good Management' the MGM will help to quantify GMP for each farm. This is integral to Variation 1 from 2017.

To be clear, reductions from 2022 are reductions from Good Management Practice not the Nitrogen Baseline.

2.12.2 Key Areas (zones) in Variation 1

There are a number of key 'Areas' in the Selwyn zone that provide additional rules and requirements and which are important to understand in the context of this research, detailed as follows:

Phosphorous Sediment Risk Area: Areas within Selwyn Zone have been overlaid with a Phosphorous Sediment Risk Area (PSRA). If a farm is within the Phosphorous Sediment Risk Area (PSRA) farmers will need to take account of the risks of phosphorous and sediment losses to water on their property. Farmers will need to address these risks through a Farm Environment Plan including the way they will be managed (ECAN V1, July 2015).

Farmers will then need to submit a Farm Environment Plan as part of a consent application. If farmers are able to comply with all conditions of this rule farming within a PSRA is classed as a controlled activity, meaning the consent must be granted. However, the rules prevent any increase above the nitrogen baseline, even if it is below the 15kgN/ha/year limit (ECAN V1, July 2015).

Cultural Landscape/Values Management Area: The Cultural Landscape/Values Management Area (CLVMA) encompasses Te Waihora/Lake Ellesmere and its margins and 20 metres each side of specified rivers.

If a farm is within the CLVMA it will need to take specific account of the rules to cultural values on the property, address these risks in the FEP and work out how to manage them. These values are outlined in Policy 11.4.4 and are designed to protect mahinga kai, wahi tapu, wahi taonga, lake health and ecology (ECAN V1, July 2015).

A FEP will need to be submitted as part of a consent application. If a farm is able to comply with all conditions, farming within the CLVMA is regarded as a controlled activity meaning the consent must be granted. The CLVMA prevents any increase above your nitrogen baseline, even if it is lower than the 15 kg/ha/year limit (ECAN V1, July 2015).

Irrigation Scheme Area: Rule 5.61 in the LWRP and Rule 11.5.14 – 11.5.15A outline that a farm is a permitted activity with regard to the discharge of nutrients onto or into land in circumstances that may result in a contaminant entering water if the property is irrigated with water from an Irrigation Scheme (ECAN LWRP, Sept 2015; ECAN V1 Decision, Apr 2015). Central Plains Irrigation Scheme (CPW) is the provider in Selwyn. CPW has an allocation of 979 tonnes of nitrogen per year.

Farmer Requirements: Farmers require a Farm Environment Plan (FEP) from 1 January 2017 if their farm is larger than 10 hectares and;

- The farms nitrogen loss over the most recent 4 years is higher than 15 kg/ha/yr; or
- The farm is in the Cultural Landscape/Values Management Area; or
- The farm is in the Phosphorous Sediment Risk Area.

Consent is required from 1 January 2017 if the above applies and if the farm is not implementing the good management practices in Schedule 24 (ECAN V1, July 2015).

Below is a map showing the Areas within Selwyn under Variation 1:

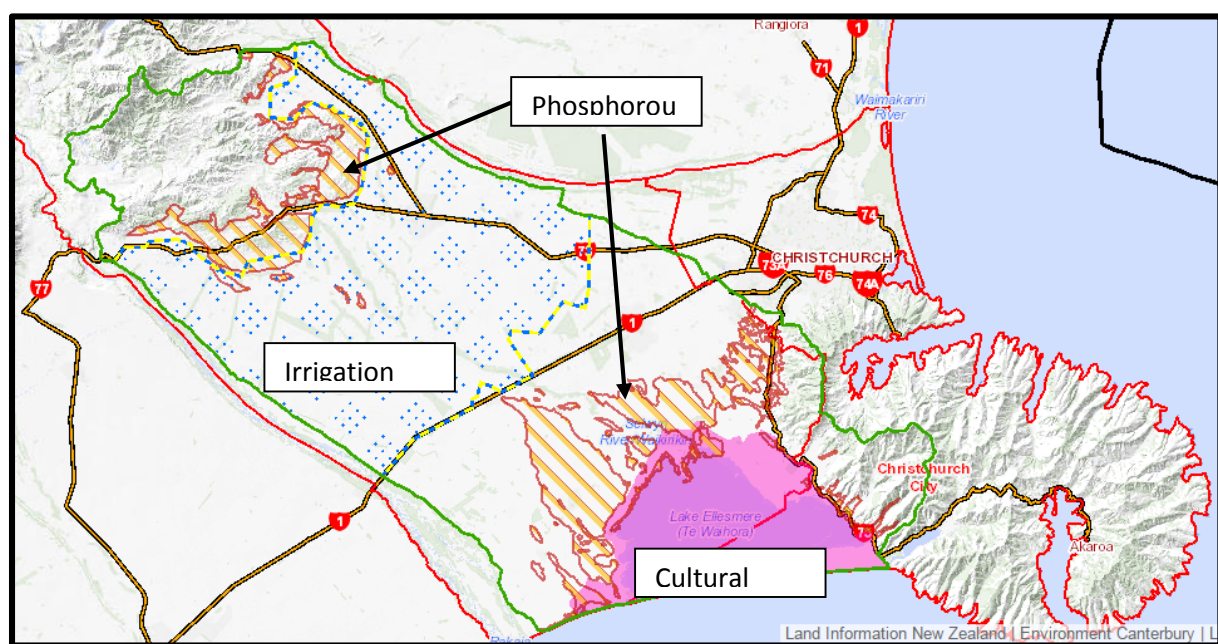


Figure 2: Selwyn Variation 1 Zones - Source ECAN

2.13 Farmer Attitudes

A key piece of research was released in July 2015 attempting to understand the attitude of farmers to the Water Management Strategy (Research First, July 2015). This research was conducted across four key districts, Hurunui-Waiapu, Selwyn-Waihora, Ashburton and Waimakariri using a telephone survey approach to contact a mix of 498 dairy, beef and lamb and arable and cropping farmers. A few of the key findings which are relative to this research follow:

- Access to water supply was seen to be the highest priority to the farmers operations, followed by animal welfare and farm profitability. Interestingly 'monitoring nutrient loss' ranked lowly at 10th on the list of priorities.
- The farmers surveyed thought the most effective intervention to ensure good management of the farm environment was to use irrigation schemes and user groups to assist, advice and support farmers.
- A high proportion of farmers were aware that there are new planning rules in Canterbury governing nutrient loss (92%) and had heard of the Land and Water Regional Plan (89%) with awareness of the variations to the plan higher in the sub-regions they affected. Half of the respondents had attended meetings on the new planning rules and what farmers needed to do and interestingly it found that the larger farms were more likely to attend these meetings.
- A majority of respondents (82%) were aware that every farmer in Canterbury is required to capture nitrogen loss data from 2009-2013 and an equal proportion were aware of Overseer. 51% stated that Overseer had been run on their property and 46% stated it had not.
- Three quarters of respondents (78%) were aware of the need for farmers to prepare a Farm Environment Plan under the new planning rules but only 16% of respondents had a plan in place with 29% stating they had started the process. Those that stated that they had not started a FEP yet (56%), a third (32%) stated that they were not planning to do anything yet in response to the new planning rules.
- A net 42.2% of farmers surveyed disagreed with the statement 'I know what I need to do (to) comply with the new plans'.

Overall the survey found that farmers were reasonably well aware of the nutrient regulation in Canterbury but it also found that uptake was relatively slow due to a lack of full understanding of what needs to be done.

One thing the survey did not cover was if the farmers understood the reason for the regulations and whether they had had any scientific data presented to them to show how their farm was impacting on the environment. The research appears to assume that farmers accept that the water ways are polluted and the onus to do something about it is on them. On the whole the research presents that farmers are relatively accepting of the regulation, its purpose and the process.

2.14 Market Evidence

Extensively the researcher has investigated evidence of the impact of nutrient rules on land values around New Zealand. The researcher attended a PINZ (Property Industry of New Zealand) webinar on 'Nitrogen Loading and Effect on Land Values' presented by Jay Sorensen who is a Registered Valuer with Logan Stone in Hawkes Bay. The webinar detailed the effects rather than the impacts on land values and in some detail described how Overseer worked and exemplified regional rules around the country. The researcher asked the question of all those participating in the webinar:

"Has anyone found any actual evidence of nutrient regulation impacting on land values around New Zealand"?

There were approximately 50 property professionals (Valuers) from around the country attending this webinar and there was no response to this question. The presenter himself had no examples of definitive evidence.

Ruth Hodges of Colliers Rural, a rural real estate agent, has publicised examples of sales that have not gone ahead in Canterbury because buyers were worried about the implications of nutrient regulation. The case study in Selwyn presented by Ruth Hodges at the ordinary meeting of the Selwyn Waihora Zone Committee (6th October 2015) and reported in The Press (11 September 2015) was a large scale dry land property with potential for conversion. The purchaser's observation of the property was that there was no baseline N completed and given the intention was to convert to dairy there would have been an impact to stocking the property and remaining within the rules. The point made was that there is much more information required for the sale of a property now and due diligence was much more involved and focused on nutrient regulation. It was noted in the meeting that there was no evidence of land values dropping in value.

ECAN zone committee member and South Island Dairying Development Centre executive director Ron Pellow was reported in Farmer (8 September 2015) as saying "When a purchaser is wanting to go and change the farming system.....that is where a much greater level of due diligence is required". He also said that as more clarity was gained about the rules, the uncertainty around price would likely disappear, and was quoted; "The rules are needed in terms of making sure we have viable economic farming systems long term and there is no point in not having adequate rules now because of what we think it will do to farm prices".

There is a generally accepted theory among rural valuers that in times of depressed economic activity, i.e. lower commodity prices, any uncertainty, like that created by nutrient regulation, can be accentuated. The opposite being true. In times of higher commodity prices and therefore higher returns to farmers,

uncertainty around factors that could be considered to impact value are considered as less significant (Colliers Research, 2015).

2.14.1 Rotorua Lakes

Research conducted by Craven M (2015a); (Craven M, 2015b) for the Bay of Plenty Regional Council to cover the impact of nutrient regulation in the Rotorua Catchment on volumes of property sales and the impact economically on farming and property values. Craven M (2015a) found that the introduction of Rule 11 was considered to introduce a nominal 10% reduction of the value of dairy farms in the Rotorua Catchment and identified this as being simply reflective of the imposition of land use restrictions. Craven M (2015a) expects a further 10% to 15% reduction in value with the introduction of the proposed plan change 'Lake Rotorua Nutrient Rules Plan Change'.

As background to this study the researcher conducted an investigation into planning with regard to nutrient regulation in the Bay of Plenty.

The Bay of Plenty Regional Land and Water Plan was made operative on 1 December 2008 and included Rule 11 which regulates increases in nitrogen and phosphorus exports from nonpoint source discharges in the catchments of Lakes Rotorua, Rotoiti, Okareka, Rotoehu and Okaro and seeks to cap nutrient exports from land at levels that existed during the period 2001 to 2004 and not reduce them (Bay of Plenty - Foster C & Kivell M, Aug 2009; Bay of Plenty RC, 2005). The rules will affect what land owners can do with their property (Bay of Plenty Guide, Nov 2008).

The Bay of Plenty Regional Council are proposing a plan change; Lake Rotorua Nutrient Rules Plan Change. Section 32 of the Resource Management Act requires that before a proposed district plan is notified there is an evaluation of the proposed plan change or proposed plan and a report prepared (RMA, 1991). The Regional Council has completed a Draft Section 32 Evaluation Report (Regional Direction and Delivery Committee, 2015) and identifies that the existing Rule 11, while effectively halting the intensification of land in the catchment, will not achieve the required outcome prescribed by the Regional Policy Statement. It recommends as the preferred option the implementation of rules within an integrate framework.

The Bay of Plenty Regional Policy Statement sets a limit of 435 tonnes of nitrogen entering Lake Rotorua each year as the sustainable lake load. This is to be achieved by 2032. Best available science indicates that the amount of nitrogen entering Lake Rotorua is approximately 755 tonnes per year, mostly from pastoral sources which include dairy, sheep, beef, deer and grazed lifestyle blocks.

The rule change will include a requirement for resource consents on properties above a certain size or leaching a certain amount of nitrogen, information reporting requirements and the setting of Nitrogen Discharge Allowances (NDA) for all properties greater than 10 hectares within the Rotorua Catchment, and establishing practical pathways to staged nutrient reduction by way of Nitrogen Management Plans, to show how landowners will make nutrient reductions over time towards their NDA and a phasing of rules between 2017 and 2032 (Regional Direction and Delivery Committee, 2015).

It appears the rules within the Rotorua Catchment are more restrictive than the rules proposed in Selwyn at this stage although, as 2022 approaches in Selwyn and depending on the outcome of the MGM and the level of reductions required in Selwyn, some examples of a similar nature could occur.

3 - Research Design

This research is a qualitative study using a case study approach. The research was participatory using a semi structured interview guide to allow interviewees to converse openly about their experiences within the context of this study, guided by the interviewer. It seeks insight and understanding to build theory and not test theory (Woodford, April 2014). Eisenhardt K.M. (1989) considers this approach of inducting theory using case studies as being especially appropriate in new topic areas. The introduction of nutrient regulation into New Zealand's rural landscape is new and especially new in Canterbury and the Selwyn-Waihora zone.

3.1 Methodology & Design

This research begins with extensive review of literature, including gathering literature on the regulation itself, researching international experience in this area, reviewing literature in the regions of New Zealand on regulation impact on productivity and land use, understanding the methods of nutrient leaching and runoff mitigation, and reviewing the literature on land value and its link with productivity.

Some quantitative analysis of farm sales in the SWWMZ has been undertaken to see if there has been a discernible trend in sales which might indicate regulation has impacted land values (see section 4.9).

But the essence of this research is qualitative, endeavouring to understand the perceptions of farmers involved in dairy farm land transactions and dairy farm management in Selwyn and gauge the impact of nutrient regulation on land values.

3.2 Literature Gap

Although the Proposed Land and Water Regional Plan and Variation 1 have been discussed and publicised for some time, the rules are progressive and do not necessarily impact on farmers directly until 2017, unless a land use change is proposed.

Because these rules are relatively new there does not appear to be any literature on, or evidence of, how nutrient regulation might impact on land values in Selwyn. This research endeavours to fill that gap.

3.3 Participants

Following the establishment of my research methodology and design, prospecting for participants was undertaken. Canvassing local land professionals for recommendations on potential case studies was undertaken. The focus initially was to find cases where a land transaction had taken place; purchase or sale, or where a property was currently on the market. The research was also interested in cases where land had recently been converted to dairy from other farm uses, in larger enterprise dairy operations and in established farming operations in nutrient sensitive locations. There was a hope to get a spread of participant understanding of nutrient regulation to gauge perception against knowledge. It was hoped that participants could be gathered from a wide geographical spread across Selwyn, from Upper Selwyn; north of Hororata and Darfield Townships, to Mid Selwyn; north of State Highway 1 and south of Hororata and Darfield, and Lower Selwyn; south of State Highway 1 – see map below:



Figure 3: Selwyn District Map - Source Google My Maps

Introductions were made by land professionals for those participants the research had selected. This was done either by phone call by the land professional in the first instance followed by a call from the

researcher, or by gaining consent from the land professional to use their name as an introduction in a cold call by the researcher to the participant.

3.4 Instrument

This qualitative research has been based around an interview guide which is included in Appendix C. The interview guide is made up of two sections.

The first section is structured with quantitative questions around the physical nature of their property, transactional information relating to a land purchase or sale, production information and nutrient regulation related information such as the existence of a Farm Environment Plan, Good Management Practice and Nitrogen Baseline. Lastly, a Likert scale to gauge the participants understanding of the nutrient regulation.

The second section is semi structured and more qualitative in its form, broken into three sections as follows:

- Perception of whether nutrient regulation is having an impact on land values now.
- Has any action been taken by participants to mitigate nutrient regulation.
- Perception of how nutrient regulation will impact participant acquisition/disposal of land in the future and ultimately how they will impact land values in the future.

The semi structure section has been designed to generate open discussion around each participant's situation because each situation is very different. This semi structured section is designed to enable the researcher to delve into areas topical to respective participants with some freedom.

3.5 Procedures

The researcher has had approval from the Lincoln University Human Ethics Committee for the interview guide and process for the interviews. A copy of the interview guide can be found in Appendix C.

After establishing an introduction as discussed above (3.3 Participants) the following procedure was undertaken:

- The researcher made a phone call to the participant utilising the telephone script (Appendix E).

- If the participant was willing to partake in the research an email was sent to them including a copy of the Interview Guide, the Research Information Sheet (Appendix D) and a copy of the Consent Form (Appendix F). Within the same phone call a meeting time and place was organised. Importantly the process was designed to be as least disruptive as possible to the participant and therefore the time and place was of their design. The effect of this was to get the participant to a place they were comfortable to talk and at a time that enabled them freedom to focus on the research questions and discussion.
- At the beginning of each interview the participant was asked if he or she was happy to consent to participation and to potential publication of the results with the understanding that they will remain anonymous. They were asked if they were happy to be recorded with the understanding that the recording would be deleted at the completion of the project.
- Each interview was conducted, recorded and subsequently transcribed.
- From the transcription a commentary of each interview was compiled following the order of the interview guide, i.e. structure question results and semi structured question results broken into the three sections (see 3.4). This commentary is recorded in section 4 as Research Results. This process was undertaken to help uncover common themes across the case studies. These common themes have been brought together in section 5 - 5.2 to 5.10.

4 - Research Results

The results of each case study and the respective features recorded from each interviewee follows. For the purposes of interviewee anonymity the physical area of each of the case study farms have been rounded to the nearest 50 hectares. The layout of each commentary follows the interview guide as described in 3.4 above.

4.1 Case Study 1

Case study 1 is of a 150 hectare irrigated bareland block of flat land located north of Burnham in Mid-Selwyn district. This land was purchased early 2015 and has since been converted to dairy. The land was previously run as a cropping farm and has a Nitrogen Baseline of 50.25 kgN/ha/yr. The property has Lismore shallow silty loam soils which are stoneless, well drained soils with a high N leaching vulnerability and medium (43%) P retention (S-map, 2015).

The property was sold as bareland with water consents in place and a new effluent consent for 648m³. Since the purchase a new 60 bale rotary dairy shed has been constructed together with a 10 bay calf shed/workshop, and a dwelling with 2 bay garage. Two more houses are planned including a homestead and 2IC dwelling. There is the option in the future to purchase a further 90 hectares adjoining the property. The purchasers also have a run-off block.

This farm is milking 580 Fresian and cross-breed dairy cows (3.8 cows/ha), budgeted to produce 275,000 litres milk solid (MS) in the first season which equates to 474 kgMS/cow, 1,816 kgMS/effective hectare. Supplements are brought in including barley, baleage and maize silage.

The property was purchased for \$7,000,000 which is \$45,752/ha or \$45,000/ha when analysed back to land only. To make this purchase possible they had to sell the dairy farm they owned at the time in Greenpark. The Greenpark property was less than 100 hectares effective but was farmed intensively with 3.8 cows per hectare. The reason for wanting to move was essentially to increase scale.

The interviewee considered they had a good understanding of the nutrient regulation in Selwyn-Te Waihora at the time of the land purchase, ranking herself 9 out of 10. This knowledge coming largely from work as an environmental consultant.

Interview phase 1 – is nutrient regulation having an impact on land values now:

The interviewee considered nutrient regulation was a large contributor to their decision to purchase.

"We knew that this (nutrient limits) was going to be the limiting factor as to whether they could convert or not."

Specifically they investigated the validity in the baseline figure advertised for the property. They asked for the baseline files and then had them audited/peer reviewed by a professional to understand whether they were fair and reasonable. They then had a consultant calculate the nitrogen loading under a dairy system to understand if they could do what they intended to do. The baseline for the block was 50.25 kgN/ha/yr and the calculation for a dairy system was 44 kgN/ha/yr. This meant they could convert the property into dairy as a permitted activity under the district plan.

Because of this they were willing to pay a higher price for the property.

The family had been looking for a dairy farm or land to convert to dairy in the Selwyn District for 10 years. The whole time they were looking there were new rules and regulations proposed by local and regional councils including regulation around ground water takes and nutrient leaching.

"It got to the point where we had to make a move. We couldn't crystal ball gaze. We couldn't predict the rules in the future. We decided that we would take the rules as they came."

The property they sold at Greenpark had been in the family for 80 years, located in a desirable area with good heavy soils handy to Lincoln and Christchurch. This area was regarded as more valuable than further inland. Since the introduction of the nutrient rules the desire for land in this area has waned due to uncertainty around how they will impact on the future of farming there. Other properties in the area have been on the market for an extended time. The interviewee's bank manager and various real estate agents had been relatively negative about them being able to sell the property. Fortunately a purchaser, who they regarded as being well informed around the nutrient rules, purchased the property at the price they were asking. What appears to have helped is that the block is just outside two relatively restrictive areas under Variation 1, the PSRA and the CLVMA. The interviewee believes there has been an impact on the saleability of land in the Greenpark locality due to a perception that the rules are or will be restrictive on future productivity and profitability.

Interview phase 2 – what action has been undertaken to mitigate nutrient regulation:

The conversion on the interviewee's farm has been to the highest possible specification. Examples of this include a two pond effluent system, effluent is now spread through the pivot irrigators, a water race running through the property has been redirected and irrigation has been changed from Briggs rotorainer to pivot.

"The best of everything has been put in to ensure we are at good management. We want to be a model farm."

There wasn't a need for feed pads because the dairy system N loss calculation was below the baseline. They considered that there may be a claw back on the baseline in the future; up to 30%, at which point they could consider a feed pad.

When asked about how nutrient regulation might impact on productivity, especially given that in 2022 there was an indication that dairy farmers will be required to reduce their baseline by 30% the interviewee thought that the new version of Overseer may help.

The interviewee considered that the impact on profitability could be significant but there was some comfort that future technology would help and they could still consider a feed pad.

Interview phase 3 – is there a perception that land values will be impacted in the future:

Looking forward to 2017 and 2022 when regulation takes affect and starts asking farmers to reduce their baseline the interviewee commented that there is likely to be further argument around the rules to smooth the way. Also that they had the avenue of installing feed pads which are not currently required because they are operating below the baseline. Overseer is likely to improve as well - an example was given of how Overseer had been run on another farm and didn't register a relative difference in nutrients leached when borderdyke irrigation was converted to pivot irrigation.

The interviewee thought that the value of their property would hold or even increase because they have ticked all the boxes. If they had to sell tomorrow they are still sitting well, not having to do extra things to make their system work.

Asked how the rules would impact on land values in the Selwyn District there was reflection on what could be purchased in other regions and that if other regions had less restriction, and Selwyn had more restrictions that impacted on the productivity of the land then land values would likely fall because you could get a more productive and profitable business elsewhere for the same money. They could have purchased a farm in the likes of Oamaru where they could have acquired something twice as large but being close to family had been the influencing factor.

They understood that a Farm Environment Plan would likely be required in the future but was not required now because they were operating as a permitted activity. However they were in the process of generating one. They also understood that land use consent may be required in the future if their baseline was pulled back.

Nutrient regulation has really come into the strategic planning for this enterprise. There was an element of hope that regulation may soften as the argument around the rules gathers when rules are implemented together with some trust in the ability of technology advances to lessen the need to reduce production and meet limits.

The final question was; what factors did they consider when purchasing a farm and how they ranked them. In this case study they were as follows:

1. Location/Family: Rakaia was considered but too far out
2. Water: water was a main driver. Te Pirita was looked at but the cost of getting water from deep bores was prohibitive
3. Soils: the property they purchased has Lismore soils with good topsoil
4. Nutrient: soils and water were determinants of nutrient leaching which is why this ranked 4th
5. Shape: always wanted a square farm with a pivot in the middle – dream

4.2 Case Study 2

Case study 2 owns 300 hectares but together with the lease of a neighbouring block. The land is predominantly of rolling to moderate hill contour, partially irrigated and located north of Hororata in the Upper-Selwyn district. This land was offered for sale by receivers and purchased mid-2014. The land was converted to dairy by the previous owners. At the time of sale the Nitrogen Baseline was 14 kgN/ha/yr and Phosphorous leached was recorded at 1.8. It is understood that the baseline has been altered to 44 kgN/ha/yr.

The property has Claremont moderately deep silty loam soils which are stoneless, poorly drained, with a medium N leaching vulnerability and low (22%) P retention (S-map, 2015).

The property has a 54 bale rotary dairy shed with concrete lead in yard from two concrete feed pads, a calf shed and two dwellings. 100 hectares of land to the western boundary is also leased. The property has 80 hectares irrigated by k-line and 20 hectares irrigated by pivot with a water consent for 78 /litres per second.

1,050 cows are milked producing 308,000 kg milk solids in the 2014-15 season which equates to 293 kgMS/cow, 802 kgMS per effective hectare, farming 2.7 cows per effective hectare.

The property was purchased for \$9,525,000 (mid 2014) which equates to \$29,398 per hectare overall or \$26,000 per hectare when analysed back to land only.

Cows are wintered off-farm in the winter to avoid pugging however the owners are looking for ways to winter on-farm to improve the economic viability of the farm.

The interviewee considered herself moderately well informed on nutrient regulation ranking herself 5 out of 10. The interviewee was not aware their farm was in the PSRA.

Interview phase 1 – is nutrient regulation having an impact on land values now:

Nutrient regulation played "very little" part in the decision process when purchasing the farm. The main driver was the potential to lift the performance of the property and in doing so lift the value. They engaged a local consultant to understand how the farm fitted into the regulatory framework and were informed there was no problem. Fonterra was also engaged to understand the compliance of the effluent system which was a problem for the previous owner. They were aware that a neighbour had been complaining about effluent runoff into a stream that ran through their property so they have undertaken to remedy this.

They considered themselves as environmentally aware, being keen to please council and neighbours in all respects. They do not have a Farm Environment Plan and are not aware of Good Management Practice. They were not aware that the farm was situated in the Phosphorous Sediment Risk Area under Variation 1 of the Proposed Land and Water Plan and that this requires them to submit a FEP with their consent to farm by 2017.

They did not consider that nutrient regulation had impacted negatively on their land to date.

Interview phase 2 – what action has been undertaken to mitigate nutrient regulation:

Physical changes made to the farm since purchasing that were considered to be environmentally friendly; not necessarily because of nutrient regulation, included shifting the location of their effluent spreading to an area on the farm that didn't have any runoff to the neighbours. They are also applying nitrogen fertiliser behind their cows when it is warm and when there is rain forecast. They have been using the

feed pads, however cleaning them out was challenging given the weather patterns in this location. They are considering putting in a calving pad.

The drive of the owners of this property is to lift the fertility and performance of the property to lift value. While they are environmentally aware most of their actions are economically driven so any benefit is pegged to financial results rather than how it could improve their environmental footprint.

They have installed a new pivot irrigator which is an efficient distributor of irrigation water although this was not replacing any existing irrigation in that particular area and the decision to do so was not driven by nutrient regulation.

If they were asked to or, as part of regulation, required to reduce the N and P loss to water they didn't believe this would impact on them in any way. The reason being that they were in a phase of lifting the fertility of the land and weren't putting a huge amount of fertiliser on in any case.

They likewise didn't believe nutrient regulation would have any impact on their profitability.

Interview phase 3 – is there a perception that land values will be impacted in the future:

Because this property was in relatively poor condition fertility-wise the owners believed that nutrient regulation had little impact on their decisions because they were only improving the land by implementing management systems that improved the lands' fertility and performance. They did suggest that if they were purchasing a fully developed block that more effort would be made to find out what the regulation was. Their understanding was that fully developed blocks were applying a lot of nitrogen.

They didn't feel that the value of their land would be impacted in the future by nutrient regulation and in fact could only see a positive impact because their N loss was relatively small.

The final question was; what factors did they consider when purchasing a farm and how they ranked them. In this case study they were as follows:

1. Profitability
2. Soil Type
3. Facilities - Aesthetics
4. Irrigation
5. Location

4.3 Case Study 3

Case study 3 is of a 200 hectare irrigated established dairy farm located on the shores of Lake Ellesmere in the Greenpark locality, Lower-Selwyn district. This property was originally purchased in 2004 by the current owners who are now marketing it for sale. The property has a mix of heavy poor draining soils including 65% Gammacks deep silty loam over sandy loam (stoneless, very poorly drained, very low N leaching vulnerability, medium P retention 35%), 20% Nixon deep sandy loam over silty loam (stoneless, very poorly drained, very low N leaching vulnerability, low P retention 25%), 10% Burwood deep loam over sandy loam (stoneless, imperfectly drained, low N leaching vulnerability, low P retention 28%) and 5% Greenpark deep sandy loam (stoneless, poorly drained, very low N leaching vulnerability, medium P retention 40%) (S-map, 2015).

The property comprises 200 hectares in effective dairy platform. It has a mix of predominantly pivot irrigation together with rotorainer and k-line irrigation with water from three shallow wells. The dairy shed is a 50 bail internal rotary dairy shed. The main house is a modern four bedroom home and there is a second three bedroom weatherboard dwelling.

The farm is milking 590 cross breed cows (2.95 cows/hectare) producing 230,000 litres milk solids in the 2014/15 season equating to \$1,150 kgMS/effective ha, 390 kgMS/cow. Supplements are brought in.

The property is on the market, advertised at over \$33,000 per hectare. It has been on the market since January 2014 and received no genuine offers. It was purchased by the current owners in June 2005 for \$2,900,000, equating to \$13,100 per hectare. \$33,000 per hectare is relatively low in comparison to dairy farms on the market and sold over the last year but the owners are keen to shift it to move on. The price was not necessarily set in light of inherited obstacles around nutrient regulation.

The interviewee considered he had an average understanding of nutrient regulation in Selwyn-Te Waihora, ranking himself 6 out of 10. He has done what he can do on-farm to comply with the regulations and understands where his property sits in the new regional plan. He was vague about areas of the regional plan that are largely not fully developed and evolving and consequently didn't think he had a good enough understanding.

The property is situated in the Red Zone under the Proposed Canterbury Land & Water Regional Plan, and within the PSRA and the CLVMA under Variation 1 of the Regional Plan.

The property does have a Farm Environment Plan. Baseline is understood to be 22 kgN/ha/yr although the interviewee took last year's Overseer assessment by one of the fertiliser companies to be his

baseline. The marketing brochure advertises a budgeted Overseer N loss at 8 kgN/ha/annum. Phosphorous runoff has been assessed at 0.6 kgP/ha.

Interview phase 1 – is nutrient regulation having an impact on land values now:

The interviewee put considerable effort into making sure the property was fully compliant when taking it to the market. The owners ensured they had a Farm Environment Plan in place and that all their consents were in place.

Asked if he thought the nutrient rules had had an impact on his property's land value he answered an unequivocal "yes".

"The rules have had quite an impact. Perception of the rules has been prohibitive. People (prospective purchasers) have been concerned about resale and once they talk to an ECAN representative or their respective bank manager, who provide their personal view about resale, they walk away"

He says they have been battling perception ever since putting it on the market. He believes the regulation has gone overboard. It is scaring away the young farmers coming through. Corporate farming is on the increase because they can manage it. And it is only going to get worse he says with Health & Safety regulation coming in.

The interviewee had purchased this property after selling their dairy farm in Te Pirita. The reason for their move was to have a farm with good shape and pivot irrigation. Their Te Pirita farm had rotorainers. They also wanted to be closer to good labour as they had had a bad experience with labour at Te Pirita.

Interview phase 2 – what action has been undertaken to mitigate nutrient regulation:

The interviewee has a feed pad being put in right now. It is almost complete. It is to have a 700 cow capacity having concrete feed bunkers, rails and effluent channels. It is costing more than \$500,000 or around \$1,000 per cow. The reason for putting this in is a combination of mitigating regulation and because it will be better for the farming operation.

The owners have improved the property considerably since purchasing it in 2005. They have put in extensive drainage so that all runoff runs to the centre of the property and is then pumped to a private wetland to the southwestern corner of the property. The property has had extensive riparian planting which is ongoing. The effluent storage and spreading systems have been upgraded. The interviewees

comment was that there wasn't much more they thought they could do to mitigate nutrient leaching through physical changes to the farm although an environmentally friendly silage pit was being thought about.

As for changes to the way the farm is managed due to new proposed rules they had tried different fertilisers. He indicated that they were required to submit a consent to farm in 2017 because they were in the Phosphorous Sediment Risk Area and Cultural Area. They would take what comes from that as it comes.

The interviewee did not think productivity was being impacted by the rules. They have an existing effluent consent for 750 cows. He believed that changes to the Overseer model could improve its accuracy and have a positive impact on farm results. He also considered that future technology could potentially help over time to effectively mitigate the rules. In conclusion he didn't believe there was going to be any impact on productivity.

However, with respect to profitability he believed compliance costs would have a negative impact on the profitability of the farm.

Interview phase 3 – is there a perception that land values will be impacted in the future:

The interviewee was not interested in buying farmland again, especially dairy. He is of the age that he does not want to be troubled with the added headache of regulation. However, if he was considering purchasing again he said he would look for a farm away from rivers and lakes, somewhere where no one can see you, away from regulation – but he then contended that "there is no getting away from regulation".

He considered that the whole farm ownership model would change in New Zealand to more corporate ownership, which is pushing the younger generation out. Every time there is a good year the cost to farm increases. Then when the market falls, costs remain the same and the struggle gets worse.

Asked about how he intended to protect the value of his farm from the impact of nutrient regulation in the future he mentioned more riparian planting and a silage pit but couldn't think of anything else that could be done.

"We can't really do any more. Everything is there, consents are all in place. It will be interesting to see what they make us do in 2017 under the resource consent. Effluent compliance is likely to require measuring with active monitoring. We will lose control of our farm"

The interviewee believed his land value would decrease in the future and did not believe there was any opportunity out there with respect to the nutrient regulation.

The final question was; what factors did they consider when purchasing a farm and how they ranked them. In this case study they were as follows:

1. Location
2. Soil
3. Shape
4. Low water cost
5. Nutrient regulation – reason was because it could change
6. Locality to labour

4.4 Case Study 4

Case study 4 is of a dairy conversion in the Te Pirita locality south of Hororata. The property was converted to dairy three years ago, converted from an intensive dairy support operation. Land area is 350 hectares of flat with pivot irrigation; the water coming from the Central Plains Water irrigation scheme. The property has a nitrogen baseline of 35 kgN/ha/yr. Soils on the property are Lismore shallow silty loam which are stoneless, well drained soils with a high N leaching vulnerability and medium (43%) P retention (S-map, 2015).

Infrastructure on the property includes a rotary milking shed, two pond effluent system, calf shed, managers dwelling, three staff dwellings and appropriate garaging, implement shed, yards, large centre pivot irrigating 250 hectares with variable rate system. The interviewee also owns one other dairy farm in Southbridge and a High Country Station as a runoff in Omarama.

The cow numbers were not collected but if it were running 3.5 cows/hectare there would be approximately 1,050 cows. Annual milk solids produced last season were 400,000 which equates to 380 kgMS/cow, 1,350 kgMS/ha. The interviewee noted that this is below capacity because before changing over to the Central Plains Water irrigation scheme they were running off insufficient ground water takes and operating conservatively. Supplements are brought in.

The property was originally purchased in 2003 as a dryland pastoral block and then converted in 2012

The property has a Farm Environment Plan. It is in the Red Zone under the Proposed Canterbury Land & Water Regional Plan. It is within an Irrigation Scheme Area under Variation 1 of the proposed plan. As

mentioned above the Baseline Nitrogen calculation is 35 kgN/ha/yr. The farming system recorded through the baseline period (from 1 July 2009 to 30 June 2013) was intensive dairy wintering. Using the version 6.0 of Overseer the dairy system was very similar to the intensive dairy wintering system. Figures have not been run through the new version of Overseer 6.2 which has the ability to model specific irrigation practices (Overseer, 2015a).

The interviewee considered he had a very good understanding of the rules, especially three years ago when many of the new rules were floated.

"I could see three years ago that these rules were going to be a major issue for Canterbury and I went to everything (meetings, seminars) I could to learn about it. I then downloaded Overseer and got my head around that with the help of a fertiliser rep".

The interviewee ranked himself 8 out of 10.

Interview phase 1 – is nutrient regulation having an impact on land values now:

Asked how much consideration was given to the rules with respect to his conversion he said "a lot". He went to as many public meetings on the rules and issues as he could. Once he had gained a good understanding of the rules and possible complications in the future he accelerated the conversion because he could see that it was going to be a big issue in the future; the sooner he converted the better he thought.

He focused specifically on how the rules could impact his property and in doing so gained an in-depth knowledge of Overseer so he could model his system both before conversion and after to make sure it was possible while keeping within the rules.

The interviewee believed there was no impact on land values now for two reasons:

1. Technology. He presented Aqualink's latest newsletter. There was an article about soil moisture probes:

"This (soil moisture probes) is one example of technology that is enabling us to use water more efficiently than we used to under borderdyke then rotorainer then pivot and now variable rate irrigators. This has happened in the space of three years. It monitors all soil moisture. We are getting nothing out the bottom through the drier milking season. If there is no water going below the probes in summer then there cannot be any leaching".

2. Basic economics/valuation theory

"The area of heavy soils in Canterbury is relatively small; situated towards the lakes and river margins. These areas are generally in smaller parcels. So if you want to buy heavy soils you will pay more for a smaller parcel. If you want scale then you buy Lismore soils – the fact you are on higher leaching soils doesn't feature because the price to purchase the heavier soils is so much higher. I would rather farm on Lismore than on heavier soils because of the effect of winter conditions on the heavy soils".

Interview phase 2 – what action has been undertaken to mitigate nutrient regulation:

Asked about what physical and managerial changes were made to the property to mitigate nutrient regulation the interviewee said he had done everything. A very good effluent system was installed with good two-pond storage and the ability to apply effluent through the pivots. Because the pivot does such a large area (250 hectares) the effluent applied is in minute concentrations. Variable rate irrigation has been installed which has made a huge difference in how water and effluent is applied. There is the ability to miss areas that are sensitive and apply more to areas that can take it. Initially the interviewee shied away from variable rate because of the expense (\$70,000) but did in the end and there are no regrets.

Urea is applied strategically. When you put the different regimes of regularity and quantity of Urea applied through Overseer the results can be markedly different. If you put 3 dressings of 100 units of Urea through Overseer it will provide a high N loss calculation. If you put 6 dressings of 50 units of Urea through Overseer the result is much more favourable. He also ensures it is trickled on behind the cows.

When the payout was good maize silage was brought in.

No feed pads have been put in but stock are managed very carefully through the wet periods with more regular shifts.

Overall the interviewee has been proactive.

"I have no sympathy for people who moan over their beer. There are plenty of things you can do to make sure you can farm successfully."

Asked how the rules were impacting on productivity the interviewee said there was no impact. They have a good baseline which has allowed them to farm at the level they want to.

There was no impact on profitability either.

The interviewee considered that the physical and managerial changes made to the farm would have a favourable impact on value.

Interview phase 3 – is there a perception that land values will be impacted in the future:

The interviewee considered that the nutrient rules were a key thing to have your head around before you buy land now. He considered the impact of land values on land nearer the lake.

"I don't think land values will be impacted near the lake. Those soils have an inherent value. You can do more on those heavier Templeton and Paparoa soils than you can on Lismore's like grow spuds and processed veges. Also the heavier soils are lower leaching. If you want to run 2-300 cows you can at a higher stocking rate and still have a reasonably low Overseer number. I don't think it (the rules) will be harmful (to land value) but I don't think they will elevate them also".

Nothing is planned to protect the value of his asset in the future.

The interviewee doesn't perceive there will be much impact on land value in the future. He believes his property is more saleable due to good infrastructure that mitigates the rules.

With a more regulated environment together with volatility in the payout the interviewee suggested that at a lower payout there won't be much trouble meeting the limits because the intensity is pulled back but in a high payout year the boundaries are pushed, more supplement can be afforded, so decisions will be more complex.

"It's not a good idea to be first but being second or third is probably quite smart".

What the interviewee means by the above statements is that the huge weight of capital invested in Selwyn dairying far out-ways what is invested in other districts so being second or third in Selwyn is smart. Where an investment in a dairy farm looks good on paper, down the track you may find you're in a particular hot spot for new rules but only have a handful of farmers around you to fight it. Selwyn has a massive investment with the likes of Synlait and Fonterra, and considerable conversion. He heard once in a public meeting where a representative of one of the big corporate dairy farmers spoke to an ECAN person and said that they (ECAN) needed to be careful because there were resources available to fight what they are proposing.

The interviewee commented that he would look very carefully at the district or regional council when purchasing. Five years ago ECAN were very difficult to deal with. When the commissioners came in it was much better. There are regions around New Zealand that could be difficult.

The final question was; what factors did they consider when purchasing a farm and how they ranked them. In this case study they were as follows:

1. Location (because they have an established base in the area)
2. Water
3. Soils
4. Regional and District Council
5. Particular zone with regard to nutrient regulations. Wouldn't be rushing to buy in Hinds. Hot spot in terms of regulation. Seems to come up a lot.

4.5 Case Study 5

Case study 5 is of an established dairy farm in the Motukarara locality, lower Selwyn District, 2.5 kilometres from the edge of Lake Ellesmere. The property is currently on the market and has been for the last year. It comprises 200 hectares of which 160 hectares is effective dairy platform. The property is flat, has good water with rotorainer irrigation, 3.5 metres above sea level, with good drainage. The nitrogen baseline is 22 kgN/ha/yr. Soils on the property are predominantly Motukarara deep silty loam over sandy loam with stoneless topsoil's, poorly drained, with a very low nitrogen leaching vulnerability medium (35%) P retention (S-map, 2015). Together with small areas of Kaipoi deep silty loam over sandy loam with stoneless topsoil, imperfectly drained, and Waikuku deep sandy loam also with stoneless topsoil and imperfectly drained. The Waikuku sandy loam has a high vulnerability to nitrogen leaching and low (22%) P retention.

The property has a 40 aside herringbone milking shed, three dwellings, 120 calf rearing shed and hay shed also used for rearing calves, a new above-ground steel 1.5 million litre effluent Tasman Tank, four rotorainer irrigators. The interviewee also has a runoff block in the Gebbes Valley of 85 hectares and a 40 hectare block which is leased nearby.

The interviewee spoke about the drainage of the property. There is a community built drain that runs through the property which he could not farm without. His farm is fully drained through this drain. Water quality in this drain is not apparently the best and they are trying to make a plan to get the water flowing in it during summer because otherwise it stagnates, but there is some resistance from Ngai Tahu. The drain drains 1,200 hectares and has a pump pumping 1.4 cubic litre/second. He mentioned that everyone on the drainage system had an environment plan and they were all riparian planting it. But the silt in the

drain is not of very good quality so removing it is creating problems. He mentioned that 30-40 years ago there were four dairy farms emptying all their effluent into the drain which has created the problem now.

He mentioned the riparian planting around the lake done under the government grants has been a waste of time. He understood there had been only 35% survival because of no planning and poor decision making. He said that riparian planting looks good but environmentally was a waste of time. He was yet to understand how it works and no-one has been able to tell him even after asking frequently. It had stopped some weed build up in streams though he thought, which was good.

The dairy platform milks 500 cows (3.1 cows/hectare) and produces 220,000 kgMS per annum which equates to 400 kgMS/cow, and 1,375 kgMS/ha. Supplements are grown on the support blocks and carried to the dairy farm. This has included maize silage in the past but the interviewee is changing to fodder beet because of its greater yield of 30 to 35 tonnes per hectare.

The property has been on the market for a year with an expectation of \$46,000 to \$48,000 per hectare.

"I've been milking cows since I was 16 so I've had enough, that's why I'm selling."

The property has a Farm Environment Plan. It is in the Red Zone under the Proposed Canterbury Land & Water Plan (LWRP). It is in the Cultural Landscape/Values Management Area (CLVMA). The nitrogen baseline is 22 kgN/ha/yr but the farming system has not been run through the new version of Overseer yet. The interviewee commented that he has spoken out about the CLVMA asking where the sensitive areas are exactly and he was unsure how the rules would apply to the Phosphorous Sediment Risk Area. He noted that he thought being in the CLVMA would not make any difference to his land or operation.

As long as we are doing things as environmentally as possible and communicate with Ngai Tahu there will be no problems. They're not as bad as you think (Ngai Tahu).

The interviewee believed that Good Management Practice had been implemented but some more things could be done including changes to the irrigation, better management of fertiliser, and management of supplements. He believes that getting under 15 kgN/ha/yr wouldn't be a problem. He mentioned that it is important to get the cows off the property in the winter and noted that the numbers (through Overseer) had not been done yet.

The interviewee considered he had a very good understanding of the rules, 8 or 9 out of 10. He has been doing nutrient plans for 5 to 6 years, knows exactly how much dry matter is coming onto the property. He has attended a number of the farmer meetings on the nutrient regulation and put his name forward to be on the Zone Committee. He has been involved in the Water Conservation (Lake Ellesmere) Order 1990, putting in evidence on behalf of the Lake Settlers Association.

Interview phase 1 – is nutrient regulation having an impact on land values now:

The interviewee's property has been on the market for a year and it is now listed with all of the rural real estate companies. He believes there is a lack of understanding of the rules which is why the property is taking so long to sell. He acknowledged that the property could do with some "tweaking". He suggested the property could do with another \$1,000,000 spent on it to upgrade irrigation to pivot for efficiency, and he could put in a feed pad.

"I'm just sick of it. Last year we spent \$220,000 on a new effluent system and there's been no increase in productivity or profitability because of it."

There are things the interviewee thought could be altered to the management to reduce the leaching; like moving the calving date forward and the drying-off date back to shorten the season, and reducing the stocking rate.

The interviewee mentioned that real estate agents were saying that the Lake (Lake Ellesmere) is only 2.5 kilometres away, the property is low lying (3.5 metres above sea level), and there is very little fall. The interviewee began comparing his farm to others in the Selwyn Catchment meaning all the land that drains into Lake Ellesmere. He mentioned that he had been to a meeting of farmers three years ago and found that farmers further up the catchment weren't particularly concerned about what was happening downstream. He said they were the big farmers and they didn't care.

He said that 12% of the catchment of the lake has heavy soils, the remainder has lighter soils. As far as nutrient loss goes he believed he was far better off being on the heavier soils. He noted that those farms further inland were probably growing more grass at this time of year (September) and could probably produce slightly more milk than he could but his water was cheaper only having to draw from 4 metres as compared to 100 metres on farms further inland. There are plus's and minus's wherever you farmed. He said it would be easy for him to meet the limit of 15 kgN/ha/yr.

Interview phase 2 – what action has been undertaken to mitigate nutrient regulation:

Physical changes made to the property because of the impending rules includes \$5,000 a year being spent on riparian planting, although he said that wouldn't be happening this year because of the payout. The new effluent system was put in as mentioned above. A new spreader (specialised rotorain irrigator) has

been purchased and effluent is pumped through it. The spreader is been relocated to 1.5 kilometres away from the shed and dwellings to avoid any stink when spreading. This system is much better as it stops the ponding that used to happen because they can now use the storage to enable spreading at optimum times.

Management changes include calving on the valley block and bringing the cows back to the platform when they are ready for milking. This system works well to protect the platform according to the interviewee. Maize had been used as a supplement because it has a low Nitrogen content but this practice is being superseded by fodder beet due to fodder beet having a superior yield.

He mentioned that he was using best practice with nitrogen application, i.e. applying it and getting 8-10mm of water on it within 12 hours.

The interviewee said productivity had not been impacted by these changes.

"Gut feeling is that if farmers understand what they are doing they are actually going to be more profitable. You can use it (nutrient regulation) as a tool. By reducing costs for example because you are using products more efficiently."

He believed the physical changes to the farm would, in the long term, increase the value of the farm but for now, they wouldn't because people don't understand the regulations.

Interview phase 3 – is there a perception that land values will be impacted in the future:

When considering the purchase of land in the future the interviewee suggested he would look at the way a farmer was farming. If the Overseer output was in the 70's or 80's for nitrogen loss he would ask what they are doing and work out how he could bring that figure back.

"If I was struggling to find a way to pull the figures (Overseer output) back then that is the way land values will be affected."

Asked about plans to do anything more to his property to protect its value with regard to nutrient rules the interviewee said that he was always doing that, meaning riparian planting. He said he wanted the property to look more attractive, it makes life more interesting.

Asked whether he thought the value of his land would increase in the future he said there would be a slight increase. He said that water was such a big issue and because he has so much water his value will definitely increase.

Asked about the impact of the rules on Selwyn District he suggested there wouldn't be much of an impact. If other regions like Ashburton are doing a similar thing then it will all be relative. He thought land values may come back a little because of the dairy payout at the moment. But once the payout comes back up again there will be some interesting things that happen and he was having regard to Fonterra shares where people purchased shares at around \$6.00/kgMS they would sell them once they came back up to this price and move to a competitor because there is so much money tied up in Fonterra Shares. He said he was not necessarily in a hurry to sell because he would have to surrender his shares and he didn't necessarily want to surrender them at the lower price now.

The final question was; what factors did they consider when purchasing a farm and how they ranked them. In this case study they were as follows:

1. Location - School
2. Water
3. Climate
4. Shape
5. Altitude

4.6 Case Study 6

Case study 6 is of a generational dairy farm that has been in the family for 80 years with three support blocks located between Leeston and Springston, lower Selwyn District. Land area is 200 hectares (200 hectares effective), fully irrigated with predominantly pivot irrigation but with some rotorainer, gun and k-line irrigation due to the difficult shape of the block. The water is supplied from groundwater. The property has a nitrogen baseline of 11 kgN/ha/yr. Soils on the property are Leeston shallow clay slightly stoney poorly drained soils with very low N leaching vulnerability and medium (38%) P retention (S-map, 2015).

Infrastructure on the property includes a 30 aside herringbone milking shed, calf rearing sheds, hay barns, ancillary sheds, four dwellings, effluent storage ponds. There are four centre pivots, one rotorainer, and one gun irrigator. The interviewee also owns three other support blocks.

The property milks 670 cows (3.35 cows per hectare) and produces 220,000 milk solids per annum which equates to 328 kgMS/ha, 1,100 kgMS/effective hectare. They buy in up to 100 tonne of grain each year and winter the herd to the support blocks he owns.

The property has a FEP and was one of the first to be produced in Selwyn. The property is in the Red Zone under the Proposed Canterbury Land & Water Regional Plan. It is in the Phosphorous Sediment Risk Area and the denitrification zone which has a 15 kgN cap. The property will require consent to farm because of the PSRA and denitrification zone rules. The interviewee considers his system is at Good Management Practice and has the support of his advisors at Opus.

The interviewee considered he had a good understanding of the rules given his position on the Selwyn Zone Committee but only ranked himself an 8 out of 10 because he could see that as the rules play out there will be questions asked and situations where he will not fully understand the implications.

He made an example of where his understanding was challenged with a question that was asked about the definition of where animals could graze in relation to a waterway. They had believed that, as under the RMA the waterway is to the edge of the water. Under the LWRP it is defined as 'the outside toe of a water bank' which means there are large tracks of land between water banks and rivers that are not allowed to be grazed under the LWRP, but are currently.

The interviewee has, in addition to his dairy farm, three support blocks totalling 100 hectares. One is in the CLVMA and is run organically so not really a concern to him. The second block is a dry support block. Overseer doesn't currently work for the system on this block which is also the case for the third block which is irrigated. These last two blocks are a concern but this won't be known until Overseer is capable of calculating the losses accurately.

Interview phase 1 – is nutrient regulation having an impact on land values now:

With regard to the saleability of his property the interviewee considers that their property has an advantage being in the 15 kgN zone given that their baseline is 11 kgN and they are under that. This is with regard to nitrogen. The management of phosphorous in the zone is uncertain so not sure how he will go with that but planting has been done to manage this.

The things he would specifically focus on with regard to the nutrient rules include the baseline, the MGM, and the ability of his property to put the system he wants into practice.

He sees that there is no impact on land value at this point. Nothing is selling around him largely because there is a slump in dairy prices so nothing really to benchmark on. He believes there is a real advantage with his dairy platform in the 15 kgN cap zone and believes that the price of his land would probably be holding in comparison to other farms.

Interview phase 2 – what action has been undertaken to mitigate nutrient regulation:

Physical improvements made to the property to mitigate nutrient rules include planting of wet areas, and putting in a 1.5 million litre effluent storage pond.

The interviewee has identified wet areas, fenced off the bottom of gullies and planted them with Carex. This provides filtering and a sediment trap. One of the bigger jobs on his property included a 16 hectare block with a gully through the middle. He fenced off the entire gully and planted it. This required reconfiguration of fencing and some alterations to suit the pivots. He planted some bigger trees as well.

"I wished I had done it years ago because this has always been a wet block. Staff on bikes were always getting stuck and there was time wasted getting them out. Now we don't have those issues. ECAN thinks it's magnificent as well so that's got to be good".

Asked whether he thinks it has enhanced the value of his property he said he suspects it has. It has improved the aesthetics and puts him on a front footing when it comes to what is happening in the catchment with regard to nutrient regulation.

The interviewee put in a 1,500,000 litre effluent storage pond two years ago after being issued an abatement notice. Soil probes have also been put in which is an advantage when it comes to recording and reporting to ECAN.

With respect to changes in management there have not been any specific changes made. The interviewee has always applied nitrogen on the basis of soil tests and application has been in line with GMP since he can remember. He said that nothing has changed because they were already doing it.

The interviewee identified that these changes had no negative effects.

"There has been some cost but the negative impact is minimal. A negative would be if rules were enforced to make him plant every drain. I'm not convinced planting both sides of a drain has any advantage. Enforcement might be a negative but we're not there yet."

"Another negative is the reporting. Everything needs recording and I'm not that sort of person and neither are my staff. Movement of stock is difficult to keep track of but we do it by using an electronic diary. Recording and reporting is definitely a negative."

The interviewee didn't think there had been any impact on his productivity or profitability.

Interview phase 3 – is there a perception that land values will be impacted in the future:

If he were looking at purchasing land in the future the interviewee would make sure the land and its nitrogen baseline had the ability to operate the system he wanted.

"The simple answer is I would match my absolute requirements of the system to the ability of the land to allow it".

The interviewee is not planning on doing any more to his property to mitigate nutrient regulation.

The interviewee believes his land value will increase in the future because there is still some versatility in the cap.

The conversation lead on to considering whether he would buy land in this regulated climate.

"Today farming is not something I would want to take on. It is too technological, too regulated, there is too much reporting, complications with human resources, and Health & Safety requirements are greater. Farmers are independent. That independence is tied within the boundaries of their farm and their farm is their castle, and everything that happens within it is by their choice or their decision and we've lost that. This worries me and it is not a place I want to be".

With respect to the impact of the rules across Selwyn the interviewee considered that the bottom of the catchment, with heavier soils and a 15 kgN/ha/yr cap, there was advantage. He thought that land sitting in the CLVMA could have some fishhooks but because of the 15 kgN/ha/yr cap, value would eventually hold or improve. Good farms on medium soils in the middle of the catchment should be alright believing that over time they should be able to adjust reasonably well. The worry is those outliers on light soils currently leaching 100 kgN/ha/yr plus. Just what the new rules mean to them he's not sure.

"I say to people who ask the question about the impact that there will be hurt but give us 10 to 15 years, give us some technology and give us some time to adjust and we will just see it as another of these steps that takes us to a new place. For greenfield developments, for example in the CPW zone, where there are limits in place you are able to design any system under that limit so there is potential within that. For those over the limit there are concerns."

"40% of land in the Central Plains Water zone will go into dairy. They can design systems to work. It might be that they put concrete down, it might be they only run at 3.5 cows per hectare, put grain in, capture some stuff, do some tricky things. But if they are good enough and bright

enough they can design a system to make it work and if they can't well, I'm sorry but we do have a system we need to take account of".

Asked about being in a more regulated environment and in the current market volatility he said that he was pleased he was "in front of the game". He is pleased he is not having to spend \$300,000 this year when the dairy price was depressed.

"It is important to understand what is coming and be in front of the game by doing things when you have the opportunity".

The final question was; what factors did they consider when purchasing a farm and how they ranked them. In this case study they were as follows:

1. Nutrient baseline
2. The lands ability to take the system I want to apply
3. Is it a farm that could create problems – future risk from a regulatory perspective
4. Infrastructure on farm
5. Location, shape and soils

Given that this interviewee is on the Selwyn/Te Waihora Zone Committee he had some insight into the rules. The rules of the Selwyn/Waihora Zone are intended to, in 2017, switch from nitrogen limit regulation to a property's baseline as it is under the LWRP to limits set by the Matrix of Good Management. And then by 2022 when reductions will be imposed measure limits by the mid-point between good management and total feasible mitigation (advanced mitigation). The interviewees' fear is that good management has moved closer to the mid-point so the question is if this is the case, will the reduction required then be less. This is an ongoing discussion.

Variation 1 has been through the hearing process, has been adopted, and has been challenged by Ellesmere Irrigation Society, Federated Farmers, and Forest and Bird. It can only be challenged on points of law at this point. The challenges from Ellesmere Irrigation Society and Federated Farmers are focused on the 15 kgN cap. Forest and Bird is focused on water quality and believes waterways need to be pristine i.e. in the 99th percentile and the current rules are not enough, so have challenged Variation 1 in its entirety. There are challenges ahead he said.

4.7 Case Study 7

Case study 7 is of a large corporate farm owner/operator with dairy farms predominantly in the Selwyn District; one is in the Ashburton District. The entity farms 4,200 hectares with 14,000 cows producing 5.5 million kilograms. This production equates to 1,300 kgMS/ha, 392 kgMS/cow, however not all of the 4,200 hectares is dairy platform, there are some run off blocks.

There has been no recent purchase or sale of land although the entity has investigated a couple of propositions.

The dairy farms in Selwyn are all in the Red Zone under the proposed Canterbury Land and Water Regional Plan and several of the farms are within the Central Plains Water Irrigation Scheme Area. The entity is applying for a multi-farm consent so that all nutrients go into one pool as a group so they can be managed better. Baselines fluctuate between farms but as a group remain pretty stable. Over the group there is 220 tonnes of nitrogen lost. The baselines range from 35 kgN/ha/yr up to 75 kgN/ha/yr with the average sitting around 52 to 53 kgN/ha/yr. The baselines were calculated through the older version.

Asked about Good Management Practice (GMP) the interviewee said that they have done lots of good things but they don't know what the GMP number is for their farms and soils so don't know if they are at GMP or not. The interviewee was frustrated at the length of time it was taking for the Matrix of Good Management to be published. They had a need to budget for the implications so they could achieve their level of GMP by 1 January 2017 in order to comply with the new rules.

Their entity supplies Synlait and is part of the 'Lead with Pride' accreditation. Synlait's 'Lead With Pride' is Australasia's only internationally accredited ISO 65 dairy farm assurance system (Synlait, 2015). To become Certified Member suppliers must demonstrate their skill and industry leadership, above and beyond the ordinary. It starts with the desire to be the best across four pillars - Environment, Animal Health & Welfare, Milk Quality and Social Responsibility (Synlait, 2015). Four farms in the interviewees group are accredited and the goal is to have them all accredited by 2017.

To become Certified Members in the Environment Pillar, suppliers must achieve excellence in efficient water and irrigation management, effective effluent management, improved biodiversity, soil quality, emissions and energy management (Synlait, 2015). This accreditation can pass as a FEP but the entity is not yet fully accredited.

The interviewee judged their understanding of the nutrient regulation at a level of 9 out of 10 and mentioned that the rules were still open to interpretation so couldn't register a 10.

Interview phase 1 – is nutrient regulation having an impact on land values now:

At the moment the interviewee didn't know if there had been a huge impact because they were under dairy use through the baseline period so they have an allocation that is relatively high and therefore freedom to farm as they always have.

"It's the uncertainty which is the impact at the moment but because of their scale of business the impact can hopefully be managed better. If buying or selling land then absolutely there would be an impact".

The LWRP allows for multi-landholding consents so this enables a more aligned management across their land holding. Rather than having 13 consents they can have just one or two. This enables better commercial decision making. They still have to meet their reductions but instead of having to meet the reductions on one farm where it may be difficult, they can do it across a handful of properties.

The interviewee made a couple of examples of the shortcomings of Overseer:

By applying nitrogen fertiliser from mid-April - May and/or through winter has a huge impact on the Overseer result for N loss, i.e. it is high. The interviewee's entity had a policy last season of not applying nitrogen from mid-April and they found that pasture production was significantly impacted early Spring this season.

"We would have been better to have kept the plant in an active growing phase rather than let it go. We wouldn't have gotten a one-for-one response but when a plant is not growing it is more prone to nitrogen losses. So we are getting a disconnect between policy, good sound commercial decision making and what model (Overseer) and science is contributing to farming outcomes".

Also the interviewee talked about urinary nitrogen. They know, based on the weights and genetics of each cow, how much they will eat and how much they can produce. This is exact science that isn't recognised in Overseer. If feeding a high BW (Breeding Worth) cow with supplements the actual urinary nitrogen concentration is a lot less than the 1,000kgN average prescribed in Overseer, especially in the Autumn period when you are typically feeding them supplements, in comparison to feeding them on grass.

"We are not getting enough recognition for this".

Asked about the specific things the interviewee would look at with regard to nutrient regulation when purchasing a dairy farm she acknowledged she would be interested in the baseline and how accurate that data was.

"There are a lot of assumptions that go into an Overseer model and it depends on the amount of data available through the baseline period as to how accurate it is for that specific farming regime. Someone can show that they are leaching 100 kgN/ha/yr as their baseline to enable better saleability but in actual fact you still have to meet Good Management Practice so you will eventually have further to fall."

The interviewee cited that some farmers were happy just chipping away, and holding off on making decisions through the baseline period because that suited their stage in life but now it was impacting them... because they had limited the ability to intensify their farm with a low baseline.

The interviewee saw benefit in incentivising regulation. Using carrot and stick analogy she agreed with the need to have some stick but - "where are you encouraging good innovation and resource use if you dis-incentivise everybody"?

"I don't disagree with user pays but disagree with being penalised for doing the right thing".

Interview phase 2 – what action has been undertaken to mitigate nutrient regulation:

Practices used to mitigate nutrient regulation include:

- Growing fodder beet from kale. This decision wasn't driven solely by nutrient regulation. Fodder beet has a lower nitrogen concentration and you can lift it to feed it so you don't have bare crops. It does work in Overseer better than other crops.
- Sustain nitrogen (coated Urea) is being used because it has a slower release of nitrogen.
- No May applications of nitrogen fertiliser – as mentioned above.
- Stocking rate is 3.3 cows/ha which is not pushing it.
- Focused on good irrigation systems, good irrigation behaviour and awareness.
- Keeping accurate records of feed and cow movements especially for things that are inputs for Overseer.
- A feed pad has been put in on one of the farms but this was more of an animal welfare and health decision rather than a nutrient mitigation tool.
- Good repairs and maintenance practices.
- Effluent spreading and trying to better match the application rates to effluent areas.
- There is no variable rate irrigation but they do have soil moisture probes.

The interviewee wasn't sure that there were any huge benefits of any of the mitigation practices other than the team were a little bit more aware.

As for negatives the main one was the amount of recording and the need for attention to detail which wasn't everyone's forte. She mentioned that there are 260 pieces of legislation a farmer needs to meet from environment to Nait, Health & Safety and others. Not everyone is designed for record keeping.

Also she sighted that there is a lot of science but it's not necessarily collaborative and it is not getting out to the farm level.

As for the impact on profitability and productivity the interviewee felt it hadn't fully made any difference because they can still do what they have always been doing. But she thought that with whatever they did it was in the back of their minds; what could be the impact on productivity. But broadly she didn't think that anything they had done with regard to mitigating nutrient regulation had impacted on productivity and/or profitability.

With regard to whether there had been an impact on land value now the interviewee thought that maybe there had been an increase but this wasn't to do with nitrogen mitigation, but more to do with increased production which translates to capital value and what someone is prepared to pay. So essentially there had been no increase or decrease in value due to mitigation of nutrient regulation.

Interview phase 3 – is there a perception that land values will be impacted in the future:

Asked the question on how she perceived the impact would be on land values in the future due to nutrient regulation she suggested that there would certainly be an impact on value, but that it was difficult to know because they don't know where they need to get to with regard to GMP. And this will be determined by how quickly they can make changes to achieve the reductions required by 2022.

With regard to plans to do things that will protect their asset's value she suggested there would definitely be things to do but again it depends on what has to be done to meet the reductions.

Asked about which direction she saw the value of their asset heading she thought it could go any which way.

"I suspect it depends on how innovative you are as a farmer as to how well you comply with the rules but also how much freedom there is to do things and have them accepted (by regulatory authorities)."

There is a bit riding on the FEPs the interviewee quipped. These have been put forward as a mitigation tool and a good idea she thought but she questioned whether they are going to get us the gains and the

kudos that we need in the community. And she questions if they are going to get the material gain to the bottom line – she suspects not.

Asked about the Selwyn District and impacts to land values she suggested it really depended on CPW getting going, getting some history behind it.

With regard to having a more regulated environment at the same time as volatility in the market the interviewee thought it depended on gearing.

“You need a license to operate (farm), and if that is what you want to continue doing then you will have to invest in infrastructure and systems to mitigate regulation but it’s really people’s ability to do it and their desire.”

She hopes the mechanism is consistent across the country. Not necessarily the rules but what is acceptable. She thinks there is absolute potential to lead the game and incentivise good practice rather than penalise it.

The final question was; what factors did they consider when purchasing a farm and how they ranked them. In this case study they were as follows:

1. Nutrient
2. Irrigation potential
3. Soil – history, fertility
4. Connectivity - technology
5. Topography

4.8 Case Study 8

Case study 8 is of a farming enterprise specifically focused on 200 hectares of dairy land located in the Lincoln area in Lower-Selwyn. This land was purchased in two blocks at a similar time around December 2014. It comprises of two dairy units. The farm operates as one dairy farm but milks through two dairy sheds. The property has a Nitrogen Baseline of 19 kgN/ha/yr.

The group also has two heifer grazing blocks in the sensitive area around Lake Ellesmere making up 250 hectares and another 250 hectare dairy farm in Dorie.

Soils are generally heavy including Kaiapoi deep silty loam over sandy loam which are stoneless imperfectly drained soils with a low N leaching vulnerability and medium (33%) P retention, Matapihi

deep silty loam over sandy loam which are stoneless poorly drained soils with a very low N leaching vulnerability and medium (35%) P retention, and Waikuku deep sandy loam which are stoneless well drained soils with a high N leaching vulnerability and low (21%) P retention (S-map, 2015). The property comprises mostly Kaiapoi and Matapihi soils.

The property has two dairy sheds although it is the intention in the future to build one centrally located shed. The property has a good range of buildings and infrastructure including a mix of pivot, rotorainer and sprinkler irrigation.

The farm milks 650 Jersey cows (3.6 cows/ha) and budgets on 260,000 litres of milk solid. This equates to \$400 kgMS/cow, and \$1,470 kgMS/ha. Feed is made on other farms owned within the group and brought in. No grain is brought in.

The two farms were purchased at between \$45,000/ha and \$48,000/ha.

The property is situated in the Red Zone for the Land and Water Regional Plan and within the Halswell Catchment under Variation 1 (Plan Change 1).

The farm inherited Farm Environment Plans from the previous owners and nothing has been done to date as a result of those FEP's.

The feeling on Good Management Practice is that they will keep doing what they are doing until GMP is released but it is considered that they are probably at 90% of what GMP will be but don't really know yet.

The interviewee judged his understanding of the rules as being 8 out of 10 noting that it is probably better than most farmers.

Interview phase 1 – is nutrient regulation having an impact on land values now:

Asked about what was considered when purchasing the dairy farms with regard to the nutrient regulation the interviewee suggested the landscape for land purchase has completely changed in Canterbury. He thought that the adage had always been that it was preferable to purchase stoney free draining soils and that no one ever wanted heavy soils. This was with respect to dairying. The nutrient regulation impacted on his decision to purchase heavier soils.

“People just look at this area (Lincoln, Greenpark) and say Oh, it's by the lake. They didn't understand that the likes of Te Pirita drains into the same lake. Although we are close to the lake our environmental impact is a hell of a lot lower than those people that think because they are on the other side of the main road they're miles away from the lake. This has meant that it's hard to

sell a farm around this area (Lincoln) because of its proximity to the lake but this is irrational thinking."

The interviewee noted that the exception is the areas around Lake Ellesmere in the PSRA and CLVMA where he believes there is a \$10,000/ha difference in land value between land around the Lake and that outside it. The interviewee felt that this perception of land being impacted by the rules because of its proximity to the lake was irrational.

"I can't see anything in the rules that says my farms, which are relatively close to the lake, are in any worse situation than anything else in the Ellesmere Catchment, and because of our heavier soils I think we're in a better situation."

He considered that the rules were definitely impacting on land value which is why he purchased these farms in Lincoln rather than competing at higher price for a farm that probably wasn't going to grow as much grass, it was going to leach more, but was further from the lake so not impacted as greatly by the perception of the rules. The interviewee did also have a belief that the area where he has purchased is within an area generally desirable for lifestyle property and that this was spreading as Lincoln Township grew so his land value was underpinned by this potential future use and this was something other than dairy.

Things that were specifically considered with regard to the nutrient rules when purchasing was the baseline figure and how their proposed system would impact in Overseer making sure that it was at baseline. Subsequent to the purchase they installed moisture probes, which was something they did on their other land, and this gave them a good lift in Overseer.

Asked whether the interviewee considered that there had been any impact on their land value given the rules, since they purchased. He thought there hadn't been.

"We purchased in a period of uncertainty. We've tried to understand the issues and made an informed decision. I think that within the period of uncertainty we have purchased at almost maximum uncertainty. I think as it is clearer what the rules are there will be a recovery. So, I think it affected the price the previous owners got for their farm but I don't think there is any more downside, only upside as far as we are concerned."

The interviewee also purchased grazing blocks within the Lake Zone. He commented that this was irrigated land just 25 kilometres from Christchurch in a coastal climate for just \$30,000/ha. He commented that "this is because no one else was stupid enough at the time but there is no further downside".

Interview phase 2 – what action has been undertaken to mitigate nutrient regulation:

There hadn't been any physical changes to the dairy farms other than a little bit of drainage which wasn't specifically because of the regulations. Effluent systems on the farm are already good. There had been moisture probes put in. No planting and he wasn't convinced with the merits of planting drains because drains are designed to take water off farm but planting along the drains creates a bank damming water before it gets to the drain, making the drains ineffective. Both dairy farms had small feed pads.

With regard to management changes the interviewee suggested they were running more of a medium stocking rate system. They have Jersey cows which are a change from the Holstein cows previously run on the block. Due to this they are not milking any more cows but because they were milking smaller cows and had effectively dropped the stocking rate they are feeding less. The irony of this is that Overseer doesn't process this management change positively because there is a drop in feed inputs and better use of pastures creating more urine and dung.

"Overseer would prefer that we use the pasture inefficiently and feed grain that would give a better N loss number because grain is a lower protein feed and pasture is a higher protein feed".

The interviewee went on to say:

"Once you have rules you lose site of the purpose of the rule and your focus is on manipulating the rules. We've got someone that knows the system (nutrient regulation) inside out so we can maximise what we do. The big picture, the environmental impact, is not even on our horizon. Our focus is on meeting the rules which is why this system is just not going to work. We've had an environmental award in Taranaki.....Taranaki District Council encourage fencing a riparian margin by offering plants through them cheaply, offering advice, and they had good uptake. But here, with strict rules and threats, you lose sight of the whole purpose of it. So make sure you comply with the rules then manipulate them to your advantage. We are focused on the rules; environmental impact is way secondary to that."

The interviewee went on to describe his observation in Europe while on his Nuffield Scholarship. He observed that most farms in Europe were on the single farm payment. There were environmental things they needed to do in order to get the payment which is in effect an incentive. Asked if he thought an incentivised system could work in New Zealand the interviewee said that New Zealand just doesn't do incentives "it does big stick and penalties".

"In Ireland I met a farmer. He was amazing. He had purchased a neighbouring farm and managed to tick off about seven different payments (through achieving environmental goals) and he was so proud of what he had achieved. All your effort goes into manipulating the system when it is regulated, but in their case you are reliant on a good environmental result for your income. I think you lose your entrepreneurial spirit which comes from trying to generate real wealth, instead, we have regulation and your effort goes into getting the most out of the system, trying to beat the system."

Asked about what benefits he has seen from the physical and management changes he said that they hadn't been going long enough yet. He also said that he had had thoughts about what they can do but with poor milk prices those had gone on hold.

Asked about the negatives he said that he had purchased land in the area knowing what the rules are going to be. He thought that for a farmer who has been farming in the area for three generations for example it would be different but because they have brought in under this system they can't complain.

Asked about the impact on productivity:

"I don't think the changes to meet the rules will impact on productivity. If we build a new cow shed in a central position we'll probably build a decent feed pad so we can get cows off paddocks and that will give us a better environmental outcome, but also help us not damage pastures in wet conditions, so there is an economic and environmental outcome. There is an area of rotorainer that could go into pivot but it saves us labour, increases water efficiency and grows more grass. We have sprinklers on farm also so we need to find a more efficient method of irrigating those parts. So there are things we can do that will grow more grass, improve water use efficiency and improve our environmental impact (reduce leaching) and so maintain production and we're on soils that ensures we're not far above the magical number of 15. If we do a 30% reduction we'll be under 15 kgN/ha/yr. I think we can do this easily".

Asked about the impact on profitability the interviewee said that there was a capital expense but that this expense creates a win-win situation, with a win for profitability and a win for the environment. He didn't think it would impact his farms because he has gone in with a moderate stocking rate and is focused on growing lots of grass and eating it, so his is not a high input Canterbury farm.

Interview phase 3 – is there a perception that land values will be impacted in the future:

Regarding the future value of his land as a result of nutrient regulation the interviewee saw that he needed to get right on top of it, i.e. understand the regulation inside and out. Then, he thought, it became an opportunity.

"The next step for us is we are going to get our advisor to enterprise our operation and then we have options. For example next door is a sheep farm (the neighbouring farm). We can go to an N loss of 15 kgN/ha/yr on that farm without having to apply for consents for change of land use or anything. Of right we can milk cows on it. We also have 17 hectares across the road and other bits of land around the district. If that land comes up for sale we might use some areas for grazing heifers, change some areas to pivots. We may be in a position where we can enterprise our whole operation, pick up some nutrients through irrigation improvements and tweak a few other things and suddenly we're the only people who can buy this land and milk cows on it – no one else can. Understand the rules, then manipulate them to your advantage."

As for protecting the value of their asset in the future the interviewee considered that if they made sure they did the baseline stuff well and made sure that they were a model farm system, fully compliant, and did some improvements to their irrigation system that they would be doing enough to protect the value of their asset.

The interviewee believed the value of his asset would increase in the future because he had brought the land at a time when it had already decreased in value and that because of the growing influence of urban (lifestyle) in the area that this underpins his lands value.

The interviewee was interesting in his response to how the regulation was going to impact on the Selwyn District. He is in the market for a heifer grazing block at the moment and he is not considering Selwyn. He was considering Mid-Canterbury because it was likely to have more lenient rules as a consequence of not having spring fed streams and land wasn't draining into a lake like Lake Ellesmere. He thought he was prepared to pay more for land in Mid Canterbury over land in Selwyn District.

With a more regulated environment and volatility in the market place the interviewee was comfortable he had purchased at a good time when the market was depressed due to the payout and at a time of heightened uncertainty with regard to the regulation.

The final question was; what factors did they consider when purchasing a farm and how they ranked them. In this case study they were as follows:

1. Ability of the land to grow grass
2. Compliance
3. Location
4. Soils
5. Opportunity

4.9 Market Analysis Results

This research has conducted quantitative analysis of the dairy land market in Selwyn District to evaluate the impact of nutrient regulation on land values.

A number of datasets have been employed. The first dataset is of dairy property sales across Canterbury, analysed to a land only rate per hectare, tracking the change in value from 2007 to 2014. It was concluded from this analysis that it was difficult to distinguish nutrient regulation from all other factors impacting on land value when assessing it across a large data series. The assessment was that the single largest factor impacting land value across that period of time was most likely economics i.e. market forces. However, the synopsis was that each property sold had its own unique factors which could impact on sale including amongst them nutrient regulation. Shape, soils, water, location, infrastructure, tenure, land class mix and compliance together with the associated productivity and profitability of the land where amongst other factors impacting on land value.

Below is a graph generated by Petersen G.M. (2014) in association with the researcher. This graph tracks the land value of a model dairy farm in Canterbury from 2000 to 2014, together with the National Dairy Price Index. These two datasets are described as follows:

- The model dairy farm analysis is of a 200 hectare flat irrigated dairy farm in Canterbury. This analysis uses the Quotable Value New Zealand Limited 'Dairy Land Price Index' together with analysed open market dairy farm transactions to track the change in value every six months (Petersen G.M. 2014).
- The National Dairy Price Index is produced by REINZ (2015). The indices have been developed in conjunction with the Reserve Bank of New Zealand. It adjusts sale prices for property specific factors such as location, size and farm type which can affect the median \$/hectare calculations.

The graph shows an upward moving trend interspersed with periods of declining value through the Global Financial Crisis 2008/2009 together with periods of depressed commodity prices.

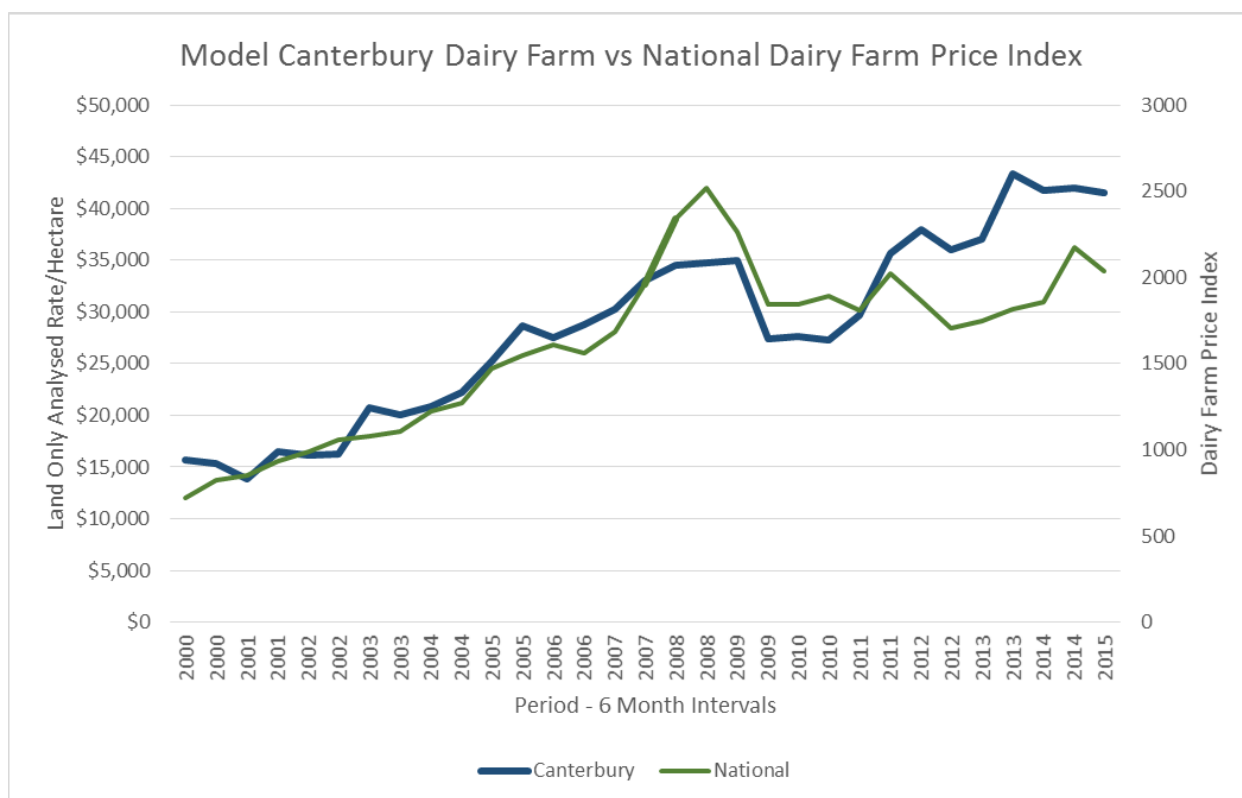


Figure 4: Model Canterbury Dairy Farm vs National Dairy Farm Price Index – Source (Petersen G.M., 2014)

The two below, generated by the researcher, use statistics from www.interest.co.nz (Interest, 2015) and the Global Dairy Trade website (GDT, 2015); both searched in November 2015. These statistics have been collated and graphed to show the trend in farmer payment and dairy commodities since 2000

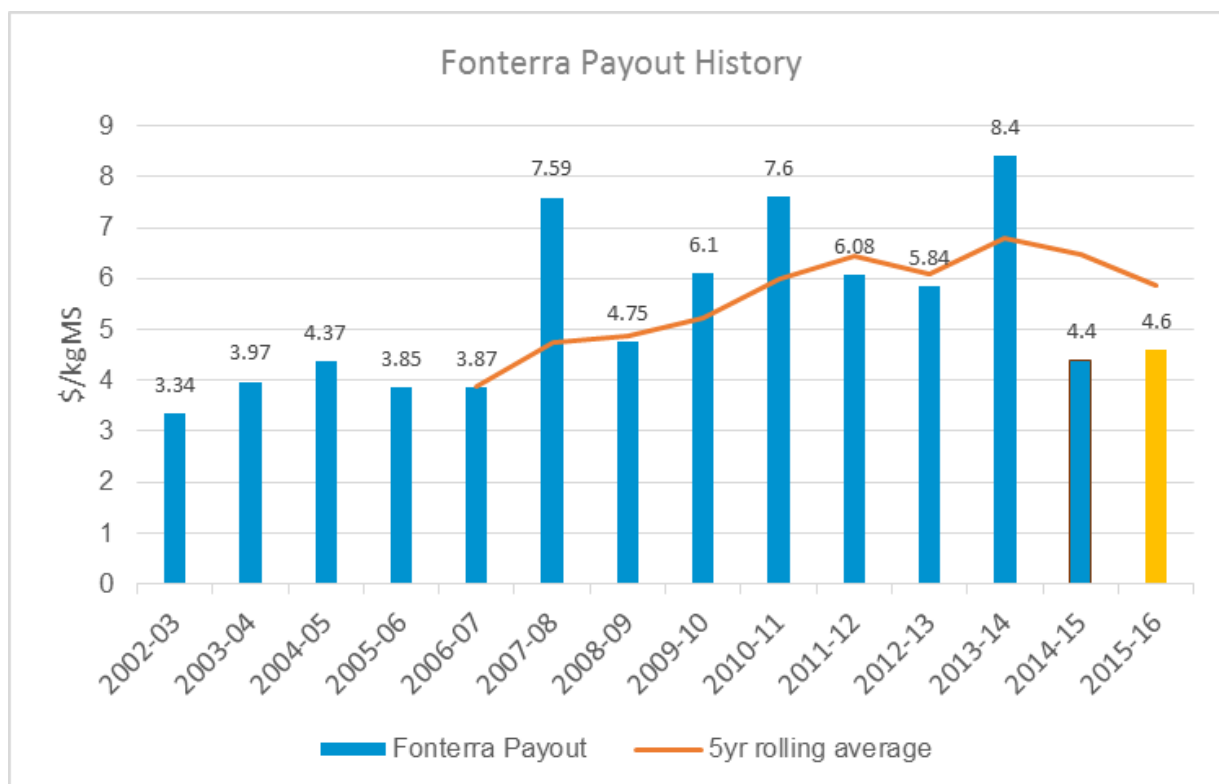


Figure 5: Fonterra Payout History - Source interest.co.nz

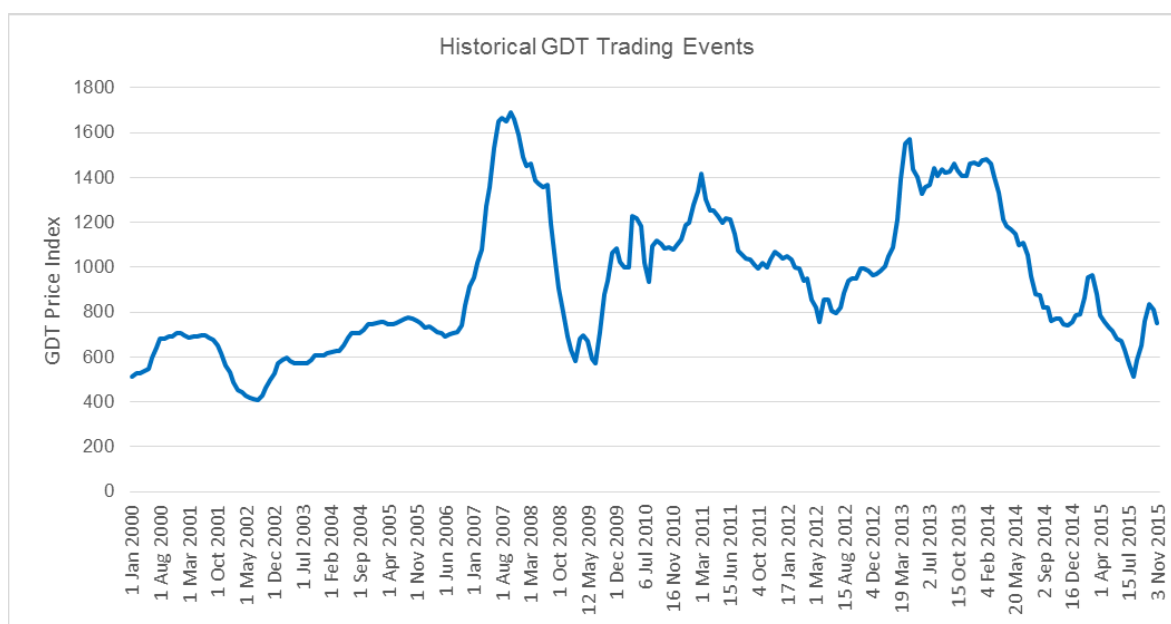


Figure 6: Global Dairy Trade Historical Events - Source GDT

These graphs show a correlation with our analysis of Canterbury and National dairy land sales above showing the impact of economics on land values especially through 2008-2009 during the Global Financial Crisis and again in 2011 -2013 when commodity prices were lower.

Using long term analysis of land sales, indices and economic statistics the researcher was not able to discern a trend related to nutrient regulation sighting economic variables as the overruling factor in land value increases and decreases.

The researcher considered that the best way to truly distinguish whether nutrient regulation was impacting land value was to track individual properties which have sold multiple times across a time period including the period where nutrient regulation is of greatest influence. It was ascertained that there were no such, easily discernible, cases in Selwyn especially as in the time between sales there is often either a change of use or significant development impacting on value which overshadows other factors.

A smaller dataset of dairy properties that have sold in the Selwyn District over the last two years sourced from Property Guru (2015) has been analysed by the researcher. Each sale has been analysed back to a land value and land rate per hectare as shown in the table below:

| Address | Location | Sale Date | Sale Price | Area (ha) | Overall Rate per hectare | Analysed Land Value | Analysed Land Rate per hectare |
|-------------------------|---------------|-----------|--------------|-----------|--------------------------|---------------------|--------------------------------|
| 161 Clintons Road | Greendale | 18-Mar-14 | \$11,408,000 | 184.1863 | \$61,937 | \$9,433,000 | \$51,214 |
| Burts Road | Southbridge | 28-May-14 | \$3,850,000 | 75.6762 | \$50,875 | \$3,575,000 | \$47,241 |
| 171 Kivers Road | Burnham | 23-Dec-14 | \$7,000,000 | 153.0000 | \$45,752 | \$6,855,000 | \$44,804 |
| 140 Midhurst Road | Charing Cross | 16-Apr-14 | \$9,600,000 | 182.2486 | \$52,675 | \$8,075,000 | \$44,308 |
| 124 Branch Drain Road | Leeston | 13-Feb-14 | \$7,000,000 | 136.3965 | \$51,321 | \$5,875,000 | \$43,073 |
| 428 Leeston Road | Springston | 17-Nov-14 | \$5,800,000 | 113.7669 | \$50,981 | \$4,775,000 | \$41,972 |
| 395 Goulds Road | Springston | 01-Nov-14 | \$5,763,000 | 113.7669 | \$50,656 | \$4,740,600 | \$41,669 |
| 1722 Rakaia Selwyn Road | Southbridge | 23-May-14 | \$7,100,000 | 158.0263 | \$44,929 | \$6,200,000 | \$39,234 |
| 1240 Hartnells Road | Hororata | 18-Sep-14 | \$8,000,000 | 188.0468 | \$42,543 | \$7,268,000 | \$38,650 |
| 428 Hudsons Road | Lincoln | 12-Dec-14 | \$6,065,000 | 133.0973 | \$45,568 | \$5,135,000 | \$38,581 |
| 5 Fyvie Road | Bankside | 17-Apr-14 | \$20,339,625 | 454.2225 | \$44,779 | \$17,497,625 | \$38,522 |
| 14 Frasers Road | Leeston | 11-Nov-13 | \$6,625,000 | 122.0000 | \$54,303 | \$4,695,000 | \$38,484 |
| 375 River Road | Bankside | 17-Apr-14 | \$22,800,000 | 531.4700 | \$42,900 | \$18,334,000 | \$34,497 |
| 847 Lower Lake Road | Leeston | 30-Oct-13 | \$3,900,000 | 97.0943 | \$40,167 | \$3,140,000 | \$32,340 |
| 475 River Road | Lincoln | 15-Dec-14 | \$3,375,000 | 79.3464 | \$42,535 | \$2,350,000 | \$29,617 |
| 190 Ridge Road | Lincoln | 05-Sep-14 | \$3,350,000 | 169.0000 | \$19,822 | \$2,750,000 | \$16,272 |
| 76 Minchins Road | Sheffield | 08-Nov-13 | \$6,300,000 | 316.8512 | \$19,883 | \$4,325,000 | \$13,650 |
| 575 Telegraph Road | Burnham | 01-Oct-15 | \$6,840,000 | 120.0000 | \$57,000 | \$5,430,000 | \$45,250 |

Figure 7: Dairy Sales 2014-2015 – Source of data (Guru, 2015)

Nutrient regulation in the Selwyn district has been most prevalent over the last two years. Perceptions will have been built over this period and if there was a clear indication of an adjustment in dairy land values as a result of nutrient regulation it would be within this period. This research has graphed the analysis above to attempt to find a trend.

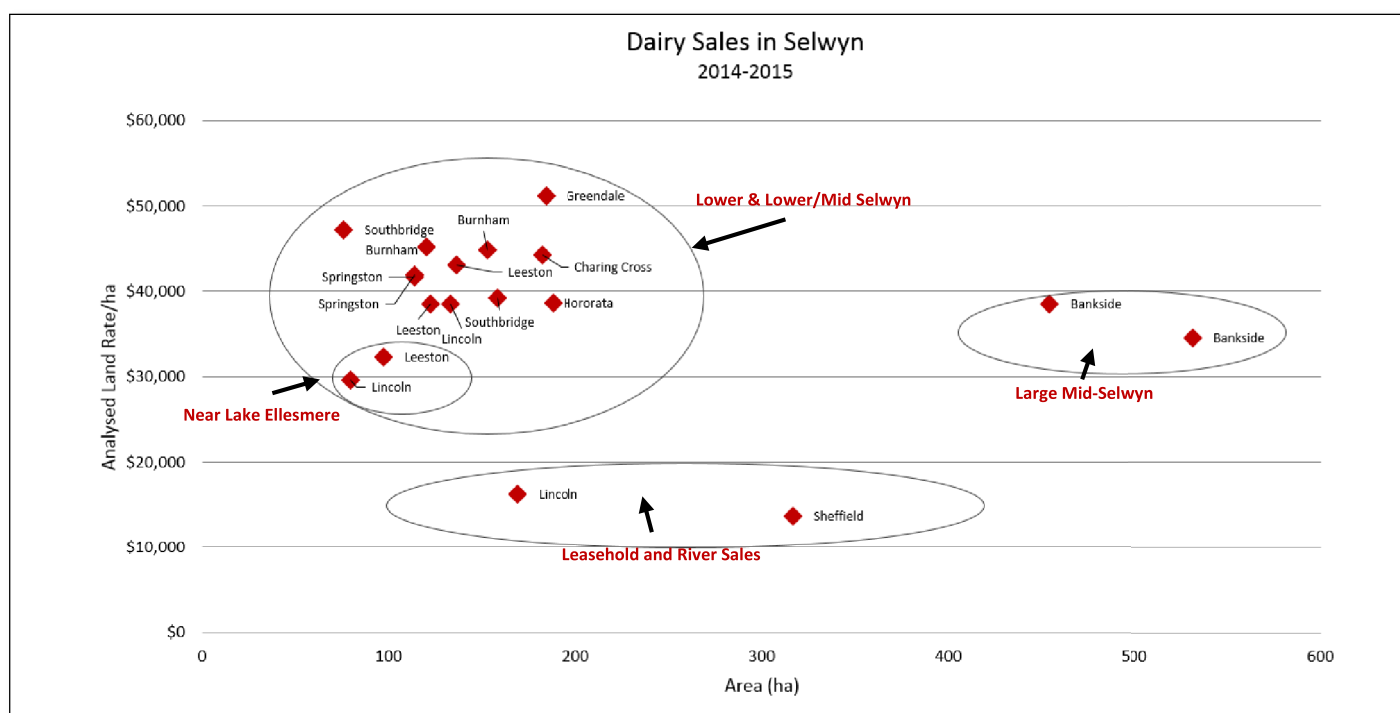


Figure 8: Dairy Sales in Selwyn District – Source (Colliers Research, 2015)

The graph above shows dairy land in Lower Selwyn area and around the Burnham and Greendale areas is generally selling at similar rates per hectare. There were two outliers in this grouping of properties located nearer Lake Ellesmere selling for somewhat lower; one of these sales being right on the shores of Lake Ellesmere.

Observations by the researcher are as follows:

- The dairy land sales in Selwyn over the last two years remain relatively high and correspond with the long term trend of dairy land values in Canterbury graphed above – note both sets of data are analysed land value.
- The nutrient rules around Lake Ellesmere are more onerous and could be expected to impact on land value the most in this area. It is noted that one of the Case Studies in this research is located adjacent to Lake Ellesmere and is on the market at \$33,000/ha. This is lower than the sale at 847 Lower Lake Road (which is adjacent to Lake Ellesmere) which sold at \$40,000/ha (analysed land value \$32,000/ha) but in keeping with lower prices paid for land adjoining the lake.
- One of the sales nearer the lake is outside Phosphorous and Cultural Areas and was purchased by one of the Case Studies in this research. It is understood there were other factors impacting on the value of this land other than situation to the lake and nutrient regulation but the price is somewhat lower than other sales in Lower Selwyn and could indicate a lower value because of nutrient regulation although this is not definitive. It is noted that this sale was a private sale so did not undergo market process.

Overall there was no absolute evidence of land value being impacted by nutrient regulation from this market analysis. This is supported by the literature (see 2.14 Market Evidence).

The researcher then expanded the above dataset to sales as far back as 2010 and graphed them with the date of sale on the 'X' axis and rate per hectare (analysed land value/total area), again to attempt to find a trend (see below).

This analysis did not highlight anything significant either.

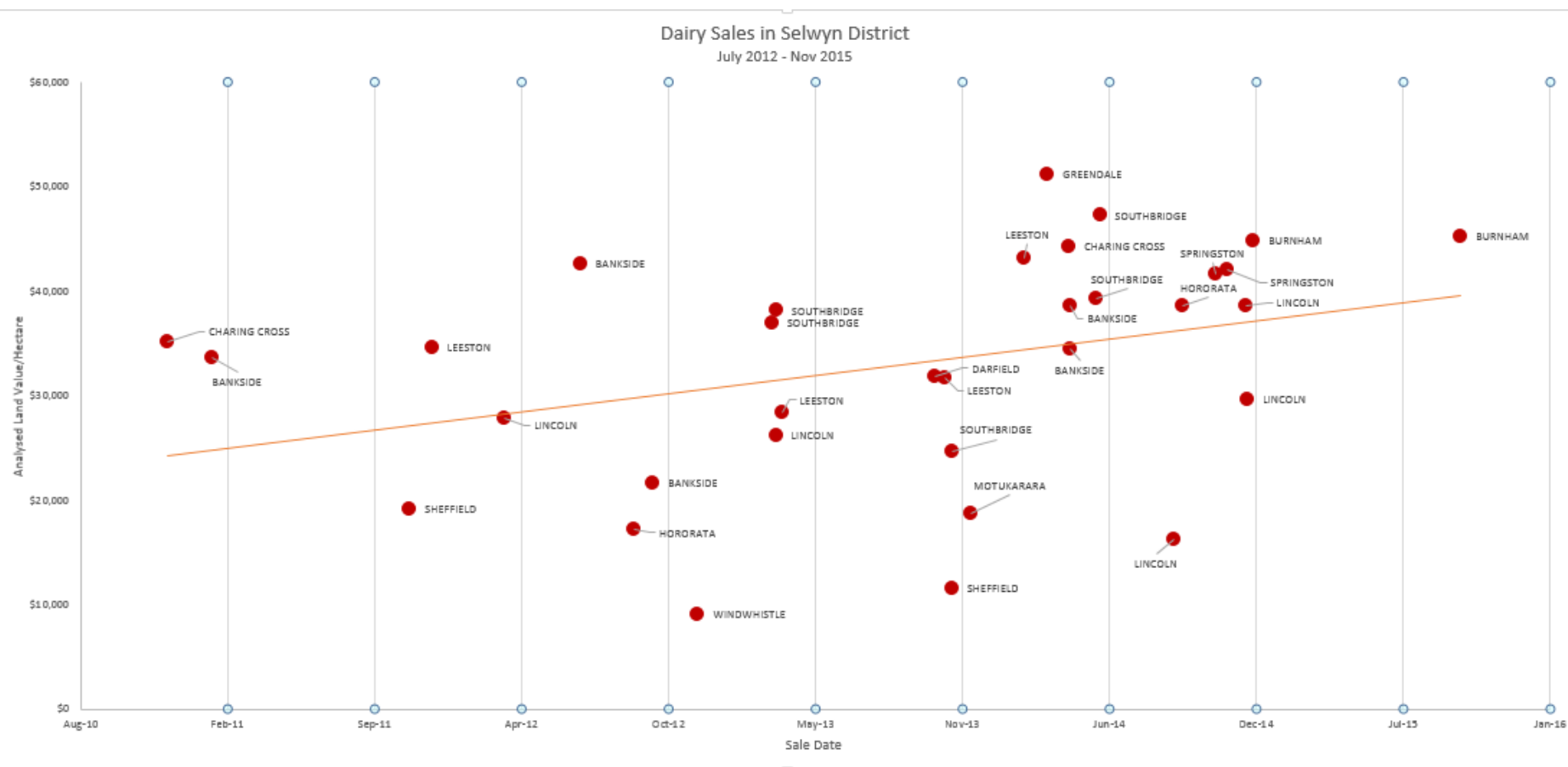


Figure 9: Dairy Land Sales in Selwyn 2012-2015 – Dataset from Property Guru (Core Logic)

5 - Research Analysis

Each case study within this research was different. The one thing in common was they were all farming a dairy system on land that was irrigated within the Selwyn District. Outside of this commonality the context of their respective situations was broad and this context was important when conducting the interview. For example the context of a farmer who had recently purchased a property was different from one who was trying to sell their property, and different again to a farmer who is not in either of those contexts but who could consider either context in the future.

Consequently the research has captured some of the participants' context in tables in the next section. Following this is a summary of each case study, drawing the most pertinent parts from each interview. Then, under separate headings is an analysis of topics that had some commonality between cases.

5.1 Case Study Context

Eight case studies were conducted on farmers farming irrigated dairy farms in the Selwyn Water Management Zone.

The mix of case studies was diverse; geographically, demographically and contextually. The sample size is small but powerful in its content with the majority of case studies being of farmers who were very well informed around the regulation in Selwyn District and so providing good informed discussion.

Below are an array of tables showing this diversity across land transaction, nutrient zone, participant understanding of the regulation and age group. The tables also show the context within which each participant was interviewed:

This first table shows land transaction context:

| Transaction Context | Conversion | For Sale | Purchased | Other |
|---------------------|------------|----------|-----------|-------|
| Case Study 1 | | | | |
| Case Study 2 | | | | |
| Case Study 3 | | | | |
| Case Study 4 | | | | |
| Case Study 5 | | | | |
| Case Study 6 | | | | |
| Case Study 7 | | | | |
| Case Study 8 | | | | |

Table 1: Land Transaction Context

The table below shows the different zones each interviewee was contending with as a result of the LWRP and Variation 1:

| Nutrient Zone | Red Zone | Phosphorous | Cultural | Irrigation Scheme |
|---------------|----------|-------------|----------|-------------------|
| Case Study 1 | | | | |
| Case Study 2 | | | | |
| Case Study 3 | | | | |
| Case Study 4 | | | | |
| Case Study 5 | | | | |
| Case Study 6 | | | | |
| Case Study 7 | | | | |
| Case Study 8 | | | | |

Table 2: Nutrient Zone Context

The table below shows the different levels of understanding of the LWRP and Variation 1, as gauged by the interviewees:

| Understanding | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---------------|---|---|---|---|---|---|---|---|---|----|
| Case Study 1 | | | | | | | | | | |
| Case Study 2 | | | | | | | | | | |
| Case Study 3 | | | | | | | | | | |
| Case Study 4 | | | | | | | | | | |
| Case Study 5 | | | | | | | | | | |
| Case Study 6 | | | | | | | | | | |
| Case Study 7 | | | | | | | | | | |
| Case Study 8 | | | | | | | | | | |

Table 3: Level of Understanding of Nutrient Regulation Context

The table below shows the different age groups the interviewees fell into:

| Age | 15-25 | 26-35 | 36-45 | 46-55 | 56-65 | 66- |
|--------------|-------|-------|-------|-------|-------|-----|
| Case Study 1 | | | | | | |
| Case Study 2 | | | | | | |
| Case Study 3 | | | | | | |
| Case Study 4 | | | | | | |
| Case Study 5 | | | | | | |
| Case Study 6 | | | | | | |
| Case Study 7 | | | | | | |
| Case Study 8 | | | | | | |

Table 4: Participant Age Context

The research has collated the production figures for each case study as follows:

| Case Study | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------|------|-------|-------|------|-------|-------|-------|-------|
| | Mid | Upper | Lower | Mid | Lower | Lower | Mid | Lower |
| Cows | 580 | 1050 | 590 | 1050 | 500 | 670 | 14000 | 650 |
| Cows/Ha | 3.8 | 2.7 | 3.0 | 3.5 | 3.1 | 3.4 | 3.3 | 3.7 |
| kgMS/Cow | 474 | 293 | 390 | 381 | 440 | 328 | 393 | 400 |
| kgMS/Ha | 1821 | 798 | 1150 | 1333 | 1375 | 1100 | 1310 | 1469 |

Table 5: Case Study Production Figures

5.2 Individual Case Study Summary

Case Study 1: Overall this case study highlighted the importance of the nitrogen baseline to people considering dairy conversion. In this case they found land that had been under a cropping regime with a relatively high baseline and they were prepared to pay top dollar to secure it. This sale was conducted privately so was not necessarily wholly market tested but the sale price is consistent with other sales evidence.

In their case they considered their land value would hold, if not, increase in the future because they are operating below the nitrogen baseline. However when considering the implications of the rules on other land holdings in Selwyn they were circumspect and considered there may be downward pressure on value because productivity may be compromised by the rules. Their context for this was that land in other regions may become more attractive because it will hold its capacity to produce as land in Selwyn is constrained therefore shifting demand away from Selwyn.

Case Study 2: This interviewee was the least informed about nutrient regulation, by their own admission and by observation and comparison with the other case studies. Their farm was in the Phosphorous Sediment Risk Area and they were unaware of this. They had however consulted an expert in Overseer modelling when they purchased the farm to help them understand whether their farm complied or not.

Nutrient regulation played very little part in their purchasing decision. They were intent on purchasing a dairy farm which was underperforming with poor fertility at a price they considered to be under the market and lifting value by improving fertility and lifting performance. There was little or no consideration about how regulation could impact on productivity, profitability and most importantly, in the context of this research, on land value.

This case study appears to be the odd one out when comparing it with the other seven with regard to knowledge around the nutrient regulation. But when recruiting interviewees it was apparent that those with better knowledge were willing to participate as opposed to those with little knowledge considered that because they knew little there would be little gained by an interview. This research had two cases where an invitation to participate was offered but was declined because they thought they would offer little to the study. This has been noted as a limitation to this research. So it has been considered that this case is not isolated and is more than likely quite common but not within the majority in Selwyn District.

Case Study 3: The interviewee was finding it hard to sell his dairy farm because of the perception that this location is impacted by nutrient regulation and that the regulation will have a negative impact on land value in the future. They are battling the perception of professionals as well as the public. This location was once heralded as the more expensive location to purchase a farm in Selwyn because of its good heavy soils and location close to Christchurch. The heavy soils in themselves are a positive when it comes to the nutrient rules and as an input into Overseer. However the property's proximity to Lake Ellesmere and situation in the Red Zone, the PSRA and the CLVMA turns the page on a farm with good location, good soils, good infrastructure, fully compliant, productive and profitable, and stamps it with perception of future complications with extra compliance, additional monitoring, and an impact on possible resale. All of these are in themselves real and not necessarily just perception. Which leads me to think in this case, land value is being impacted, now, and perceived to in the future. The fact that the property is not selling at an arguably reasonable price indicates this. The commentary that potential purchasers are not purchasing because they are concerned about resale in the future indicates this.

It is noted however the interviewee did purchase this land at what appears to be a discounted price in 2005. Its physical location next to Lake Ellesmere and the consequential impact of a high ground water table and salt from the lake are possibly big impacts on land value also.

Case Study 4: This interviewee appeared to be very well informed on the nutrient rules and well in tune with how they could impact on his farm. He has acted quickly to implement physical and management changes to his farms to mitigate against the rules. He has been quick to intensify his farm before the rules take full effect and ensure they enhance the value of his property.

Being well informed on the nutrient rules and on new technology this interviewee could make objective, economic decisions to make his farm fit into the new environmental framework. This has come about through his own proactive attitude.

Case Study 5: This interviewee is in a situation of wanting to sell his property but battling the perception of nutrient regulations impacting his saleability. He is selling to retire because he has been in the game a long time. He is not necessarily selling because of the new rules but they were prevalent and he was not interested in the amount of recording and reporting that came with the rules.

The interviewee has done all he can to be in front of the regulation and his property is by all accounts in good environmental state. It is the location near the lake that he considers is impacting on its sale due to negative perception from professionals and public alike.

Case Study 6: In summary this interviewee is reasonably confident his farming system works within the limits put in place by the LWRP and Variation 1 and he has done enough on farm to mitigate the rules. He is also confident his land value is holding with respect to the nutrient regulation (not factoring in current dairy payout volatility), and believes the value of his land will increase given he is well within the rule limits put in place. He hasn't been required to do a great amount to meet regulation requirements but there are some elements of the rules that are not fully understood yet like, how phosphorous is to be measured and limited and the MGM has yet to be published.

Case Study 7: Case study 7 is unique to the majority of farming in Selwyn in that it is a large corporate dairy farmer. One thing that came from this interviewee was that there is real potential to mitigate nutrient rules better being a bigger multi farm entity with scale. The concerns around elevated regulatory requirements in recording were still evident but these were more easily catered for by a corporate farm entity that has specialists in various litigious fields such as the environment.

This interviewee was well in tune with the rules and what their implications might be. She is poised for the Matrix of Good Management. More importantly she is aware of it and how it works which is something other farmers have fallen short on. There was a little more forward thinking.

Case Study 8: This interviewee came across as being well informed about nutrient regulation and experienced in the realm of farmland transaction. He also had a good global, big picture, view on the consequence of regulating with a stick, drawing from observations made in Europe.

This case study provides a good example of someone informed, using his knowledge to take advantage of the opportunity that comes from negative perception and in-turn uncertainty. His views are in contrast to case study 3 and 5 who are farming in the Lake Zone and trying to sell their property, and also in contrast

to those case studies of land owners north of State Highway 1 on lighter soils (in particular 1 and 4) who believed that the heavier soils were a disadvantage.

This interviewee had purchased their farm from case study 1. Case study 1's reason for moving was to get on freer draining soils and increase scale. Case study 1 did mention that they wondered what Case study 8 knew that they didn't i.e. after being told by bankers, agents and advisors that they would have trouble selling their farm because of its location close to the lake they had found a purchaser who was willing to buy their property at a price close to what they had wanted. Case study 1 seemed to be surprised that it had sold so well and was second guessing their decision thinking that they had divested out of a potentially difficult investment. It is interesting that Case study 8 is so positive about their investment.

What is also interesting about Case study 8 is that he had looked at the farms owned by case study 3 and 5 for purchase and made an offer on Case study 5. He said he was well below Case study 5's expectation. Case study 8 believed that both Case study 3 and 5 were inferior properties due to their proximity to Lake Ellesmere and in CLVMA and PSRA.

It was not difficult to be drawn into the positive perspective case study 8 had for his farm and the reasoning for his purchase decision. It appeared to be based on sound judgement and measured knowledge of the market and of the nutrient regulation. It remains to be seen whether his decision was a good one but given the scale of his landholding, his ability to enterprise and tweak infrastructure and systems, and given that his baseline is relatively close to the magic 15 kgN/ha/yr it appears there is real strength in his operation and the ability for him to maintain, if not improve value.

Case study 8 had an axe to grind and that was with the use of rules as a way to make people do things. He mentioned several times in the interview that he was focused on the rules and how to manipulate them. He had lost sight of the reason behind the rules and was intent of making sure his land met the rules for the benefit of his productivity, profitability and land value, not so much for the environment. Case study 7 had had a similar view, seeing benefit in a more incentivised system.

5.3 Baseline N

Most of the interviewees were comfortable with their respective nitrogen baseline figure and their ability to operate the dairy farming system they wanted within that baseline as a limit. There was a general confidence that when the rule limits become effective from 1 January 2017 that they could either maintain their system within the limits or could adopt mitigation that would easily enable them to remain compliant.

Interestingly a majority of the interviewees saw opportunity with how they could manage their nutrient leaching and remain compliant while still remaining productive and profitable and as a result maintain or enhance their land value.

Below is a summary of the nitrogen baseline assessments for each case study:

| Case Study | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------|----|----|----|----|----|----|----|----|
| Baseline N | 50 | 44 | 22 | 35 | 22 | 11 | 53 | 19 |

Table 6: Nitrogen Baseline

5.4 Mitigation

All of the interviewees had implemented some level of mitigation over the last two years. Some had made changes for the purpose of mitigating nutrient regulation but the reasons for this ranged from:

- Improving the saleability
- Ordered by council to do so
- To be as compliant as absolutely possible – in the case of conversions

Some had made changes for cross purposes i.e. for farm system efficiency with the natural by-product being that it is favourable when inputted into Overseer and therefore improves the nutrient leaching status of the property.

The most common mitigation was effluent storage and discharge.

Many interviewees saw a change to their irrigation type as providing a good potential gain in their nutrient budget, i.e. where their farm had spray irrigation (rotorainer) they recognised that by replacing this with pivot irrigation they understood that there would be an improvement in their Overseer result. Some interviewees had gone a step further and installed variable rate irrigation, and/or soil moisture probes.

All of the interviewees in the Lower Selwyn district had completed some form of riparian planting and had plans to continue with this program. Two of the interviewees were sceptical about how useful this environmental measure was indicating that the benefits are difficult to understand from a pure water quality standpoint but they were happy that they had done it for the aesthetic appeal of the property as a result and the feel good factor. These lower Selwyn District farmers had also completed extensive drainage on their property which was not necessarily to mitigate regulation but due to the nature of their soils being heavy and poor draining.

Fodder beet was being grown by several of the interviewees. They considered it as having a higher yield than other crops, a lower nitrogen impact and a positive result when put through Overseer. A field trial completed at Lincoln University found that achieving optimum nitrogen use efficiency careful attention needed to be made to nitrogen fertiliser application where a sub optimal supply of nitrogen can lead to poor yields whereas excess nitrogen application may cause nitrogen leaching and environmental pollution (Chakwizira, Ruiter, & Maley, 2014).

The table below lists each of the mitigation practices being undertaken by the case studies:

| Mitigation | 1-Mid | 2-Upper | 3-Lower | 4-Mid | 5-Lower | 6-Lower | 7-Mid | 8-Lower |
|-------------------------|-------|---------|----------|----------|----------|---------|----------|-----------|
| Effluent Upgrade | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Change of Irrigation | Yes | Yes | | Yes | | | Yes | Potential |
| Irrigation Improvements | | | Variable | Variable | Effluent | | Effluent | |
| Moisture Probes | | | | Yes | | Yes | Yes | Yes |
| Feed Pads | | Yes | Yes | | | | Some | Yes |
| Fertiliser Application | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Riparian Planting | | | Yes | | Yes | Yes | | Yes |
| Drainage | | | Yes | | Yes | Yes | | Yes |
| Changed feed Inputs | | | | Maize | Fodder | | Fodder | |

Table 7: Mitigation as a Result of Nutrient Regulation

5.5 Perception of Impact on Land Value to Heavier Soil Localities

There was considerable focus on the heavier soil catchments to the Lower Selwyn District when discussing nutrient regulation. There were four interviewees farming on those heavier soils in the Lower Selwyn District around Lake Ellesmere. They were generally comfortable that the nitrogen leaching limit of 15 kgN/ha/yr is an easy limit to farm within given the low leaching qualities of the heavier soils. For those interviewees trying to sell their property in this area they felt that the public (the buying public) had a generally poor perception of this locality due to the implications of nutrient regulations. However, this wasn't limited to potential purchasers and rather was caused by the perception of professionals such as bankers, real estate agents, farm advisors and lawyers. They felt that this perception was irrational and that there was a generally poor understanding of the rules and their impact on dairy farms in this locality

that was creating this perception. One of the case studies was of a farm recently purchased in this locality. He believed he had taken advantage of this perception and corresponding uncertainty and purchased relatively well. He had looked at two other properties (case studies 4 and 5) and put an offer on case study 5 and considered that each of these properties being in the relatively sensitive lake area, within the phosphorus and cultural areas, that their prices should be discounted – not so much because of the rules but more because of their situation to Lake Ellesmere and the generally inferior nature of these properties.

For those case studies farming on the lighter soils further inland they had an opinion on the heavier soil locations. They preferred to farm on the lighter soils because of the difficulty of farming on the heavier soils in winter. They were circumspect about how the rules were going to impact on land values in that location but generally indicated there would be an impact. One of the case studies had sold within the heavy soil locality to be on the lighter soils so that they could gain some scale and also due to the nutrient rules.

I conclude from these interviewees that there is a perception around the impact of the nutrient rules on land values in the heavy soil areas around Lake Ellesmere, and that perception is around the future saleability of this land as the rules come into effect. However, three of the four interviewees in this area considered there was definite advantage in farming in this location because:

- Low leaching soils
- Farming was a permitted activity at an N loss of 15kgN/ha/yr and this was easily attainable
- Its location close to Christchurch City would always underpin values
- There was versatility in what they could farm on their heavy soils

While there appears to be an impact on the saleability relating to nutrient regulation to two of the case studies in this research it is noted that the economics of farming in a year of lower dairy payout creates a heightened sense of uncertainty in general. As found in the literature (see 2.14) in a climate of depressed commodity prices the factors that impact on value are accentuated and consequently the level of uncertainty is heightened.

5.6 The Negatives of Regulation

Each of the interviewees mentioned something about the additional recoding and reporting that was required as a result of the new regulation. Half of the interviewees considered this recording and reporting was impacting negatively on their farm management and general enjoyment of farming. They

were looking forward to getting out of farming altogether and therefore avoiding the growing pain of additional paperwork. This was not restricted to nutrient regulation but included Health & Safety and compliance. They felt they were losing control of their farm.

5.7 How has Regulation Focused Farmers

All except one of the interviewees were focused on understanding the rules and doing what they needed to do to comply with the rules. Two of the interviewees verbalised this and said they were completely focused on how the rules impacted on them and were intent of doing whatever it took to make sure they remained within the rules. They felt their focus had been taken away from the real issue which is to improve water quality. At the same time they both considered that an incentivised system should be explored referencing the incentivised systems in Europe.

5.8 The Impact of Nutrient Regulation on Productivity, Profitability and Land Value

None of the interviewees felt that their productivity or profitability would be impacted negatively due to the nutrient regulation. Many of the interviewees had researched technology and systems to install and implement to help mitigate the nutrient regulation and at the same time have found real benefits to their operations. There was a general hush around how much all the mitigation measures had cost and the impact of that cost and/or the return on that investment. Three of the interviewees had drawn the line on some measures of mitigation either because they were under the nutrient limits now so deliberated there was no benefit to their system of spending more capital on infrastructure or systems that could bring their N losses down further. One of the interviewees mentioned that he could spend a further \$1,000,000 of capital to improve and renew his existing infrastructure and improve his environmental footprint but he had had enough of spending for no return.

The majority of interviewees felt that their land value would stay the same or increase in the future under the impending nutrient regulation. Two of the interviewees who had their farms on the market felt that the perception of the impact of nutrient rules on land values in their area was impacting on the saleability of their land. They had not lowered their expectations as a result maintaining that the perception was not based on anything real, that their farms were or could, with relatively small improvements, easily be within the nutrient limits, and that the farms were productively solid propositions.

5.9 Will the Face of Farming change in Selwyn

Three of the interviewees (one being a corporate farming entity) had large multi farm operations and had the ability to 'enterprise' their holdings to better manage their nutrient losses so that where they had one farm that was leaching more than the regulated limits this could be offset by another landholding that was under the limits. They each saw this as creating a considerable advantage over farmers with one landholding and farm system.

One of the interviewees considered that with the advent of increased regulation and with it elevated recording, reporting, mitigation and capital expense that farming in Selwyn was only now attractive to larger corporate models.

5.10 Factors Considered when Purchasing Farmland

The final question of the interview was somewhat superfluous to the context of the research but did discover something unexpected. The participants were not constrained in the factors they considered i.e. they chose the factors they thought were most important. While there are a considerable number of variables considered when purchasing farm land, as discovered across this relatively small sample; location, water and soil stood out above all other factors as being most considered as important. Within the context of this study 'Nutrient Regulation' showed relatively poorly. The two participants who were part of larger enterprise type operations ranked nutrient regulation as their number one consideration. Across the other six participants it either ranked poorly or not at all. The researcher is conscious that the context of the interview could have swayed participants' response.

The table below shows participant ranking:

| Factor | CS-1 | CS-2 | CS-3 | CS-4 | CS-5 | CS-6 | CS-7 | CS-8 |
|-----------------------|------|------|------|------|------|------|------|------|
| Location | 1 | 4 | 1 | 1 | 1 | 5 | | 3 |
| Water | 2 | | 2 | 2 | 2 | | | |
| Soil | 3 | 1 | 4 | 3 | | | 3 | 4 |
| Nutrient | 4 | 5 | | | | 1 | 1 | |
| Shape | 5 | | 3 | | 4 | | | |
| Presentation | | 2 | | | | | | |
| Irrigation | | 3 | | | | | 2 | |
| Council | | | | 4 | | | | |
| Regulation/Compliance | | | | 5 | | | | 2 |
| Climate | | | | | 3 | | | |
| Topography | | | | | 5 | | 5 | |
| Farming System | | | | | | 2 | | |
| Infrastructure | | | | | | 4 | | |
| Connectivity | | | | | | | 4 | |
| Opportunity | | | | | | | | 5 |
| Productivity | | | | | | | | 1 |
| Labour | | | 4 | | | | | |

Table 8: Ranking of Factors considered most important when purchasing

5.11 Overall Discussion

All but one of the case studies were informed enough about the nutrient regulation to form an opinion on their situation with respect to nutrient regulation and its impact on land value. Across the sample there were varying degrees of uncertainty around how the rules were going to impact on their respective landholdings but regardless of this uncertainty each was proactively implementing mitigation to meet the requirements of the rules.

Case study 1 sold in Lower Selwyn to be in Mid Selwyn to gain scale but also to divest from what they perceived was a potential problem with the impact of nutrient regulation in Lower Selwyn. Their perception was built largely on public perception but also on a good understanding of the rules. On the flipside case study 8 purchased their farm in Lower Selwyn considering there was opportunity in this location and paid what appears to be market price for it. Case study 8 has a number of farms that he can enterprise so he can manage nutrients across the portfolio. The property purchased in Mid Selwyn by case study 1 was a bareland arable farm which they converted to dairy. They saw opportunity in purchasing a farm with a high Baseline N that enabled them to comfortably convert within the rules.

These two case studies highlight that every land transaction decision is built on different business strategies and horizons.

Case study 3 and 5 are both trying to sell their properties. They farm near Lake Ellesmere, both in the PSRA and one in the CLVMA. Both have and are doing things on-farm to mitigate against nutrient regulation to improve saleability. Each of these case studies noted they were battling public perception which was that land located close to the lake would be difficult to sell in the current environment of nutrient regulation and consequently it appeared they were having trouble selling as their properties had been on the market for an extended period of time. Case study 8 had made an offer on case study 5's property at a level well below the expectations of case study 5 and was turned down, but purchased a farm not far from case study 5 at near market price. The key factor here was that the property case study 8 purchased was outside both the PSRA and the CLVMA. Case study 8 considered that case study 5 and 3 were inferior opportunities due partly to their proximity to the lake and being within the PSRA and the CLMVA.

Case study 2, relative to the other case studies, was less informed about nutrient regulation. Their business by their admission was tenuous but this was more to do with purchasing just before a fall in the dairy payout and farming through drought than it was about nutrient regulation. Nutrient regulation did not enter their strategic thinking to the same level as the other cases even though there appeared to be some barriers ahead with how they farmed their land being in the PSRA.

Case study 4 had a very good knowledge of the rules and had proactively educated himself on the rules and Overseer since they were first brought out. He consequently converted a block of land in Mid Selwyn earlier than he might otherwise have done had the nutrient regulation not been a factor. He has converted using a high level of technology, especially around his irrigation, within the rules. Being a shareholder of CPW has helped his nutrient leaching profile. So nutrient regulation has been at the forefront of this case study's strategy to farm.

Case study 7 is a corporate farmer with a number of dairy farms in Selwyn. There was a concerted focus on the impact of nutrient regulation and enterprising their operation to bring everything under on resource consent, and then being able to manage their nutrient status was a strategy being used to mitigate the rules.

Case study 6 is actively mitigating for the rules, as are all the other case studies. The opportunity this case study saw was his location in Lower Selwyn on heavy soils where he could easily farm within the 15 kgN/ha/yr limit and therefore be a permitted activity. It is noted that this farm is operating at a lower stocking rate to other comparable dairy farms in the locality.

Case study's 7 and 8 both believed that an incentivised method of regulation would be preferable to the 'stick' of nutrient limits. This is also considered as a good option by Joy M. (2015) in the literature.

The majority of case studies suggested that land values would increase in the future. Not because of nutrient regulation but despite it. The table below summarises this result:

| Case Study | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|--------------------------------|----------|----|----------|----------|----------|----------|----------|----------|
| Impact on Value now | Positive | No | Negative | Positive | Negative | Positive | Positive | Positive |
| Impact on Land Value in future | Positive | No | Negative | Positive | Negative | Positive | Positive | Positive |

Table 9: Impact on Value now and in the future

6 - Conclusion

This research did not find any conclusive evidence that land values were being impacted by nutrient regulation however there were some subtleties around land transactions or lack thereof that could reasonably be perceived as evidence of an impact but there are other subtleties that could also be contributing and accentuating the nutrient regulation factor.

Two case studies in this research were of farms located near Lake Ellesmere, in relatively special zone 'Areas' (PSRA and CLVMA). They have been on the market for an extended period of time, and have not sold. The general perception from these case study interviewees who own these properties and also from other case study interviewees in this research together with rural professionals alike was that it is nutrient regulation that is impacting on their saleability. Unlike the situation in Rotorua (see 2.14.1) where the productive capacity of land use around the Rotorua Lakes was being impacted by nutrient regulation, the rules in the LWRP and Variation 1 are not generally impacting on productive capacity (see 5.8) as these farms are farming at close to the 15 kgN/ha/yr threshold for a permitted use. There are physical factors involved with these properties, like high water table, infrastructure and climate, which could also be impacting on saleability in an economic climate of lower dairy payout and lower sale volume where potential purchasers attribute more weight to any factor that impacts on land value.

There were other saleability subtleties uncovered in this research. They were more opportunistic than inexpedient. One case study purchased a dryland property and converted it to dairy well within the nutrient limits. They were happy to pay a relatively high price for the land because of the high nitrogen baseline of that property. Another case study brought forward conversion of a block of dairy support land because he perceived that sooner would be better than later as the nutrient regulation came into effect, so he saw opportunity in doing so. And a third case study purchased a dairy farm relatively close to Lake Ellesmere because his perception was that uncertainty around the rules provided a window of opportunity to purchase at a level below what the land could in the future realise.

Within this sample 'opportunity' afforded greater weight than 'barrier' when considering nutrient regulation and this was most true as participants knowledge of the rules and regulation was accelerated. Nutrient regulation has become an integral part of farmer's strategic thinking with purchase and sales decisions, and mitigation management. This was also noted in the literature by professionals working in rural real estate in Selwyn.

There appeared to be a line drawn in Selwyn, around State Highway 1, between the heavy soils of Lower Selwyn and the lighter soils of Mid Selwyn. This demarcation distinguished levels of perception with regard to the impact of nutrient leaching and runoff. Lower Selwyn is perceived to be the area where

impact is greatest due to its proximity to Lake Ellesmere. Mid and Upper Selwyn, due to their distance from the Lake, being perceived to be impacting less. In this research the Lower Selwyn case studies had Baseline N calculations of between 11 and 22 kgN/ha/yr compared to 35 to 53 kgN/ha/yr in the Mid and Upper Selwyn areas. It is understood from the literature that surface water and groundwater from Mid and Upper Selwyn leaches through to Lake Ellesmere (see section 2.3), much like the surface water and groundwater in Lower Selwyn drains to the Lake. So the imbalance in perception appears to be unwarranted. Regardless, perception is a powerful phenomenon and it appears to be impacting to some degree on the saleability of land located close to Lake Ellesmere.

The theory built from this research is that regulation, whether it is correct or not, is attempting to classify farm land based on its inherent, nature given qualities; soils, climate, contour. And farmers are being asked to farm the land within that classification. In cases where that classification does not fit then impact on land value is likely, which is saying that where there is an intention to farm at an intensity above what suits the ethereal qualities of the land then that farm operation is polluting. Farm within the limits created and land value will continue to be impacted by normal market forces. However, in this period where rules are being created, there is a level of uncertainty where those best informed will likely overturn opportunity and those less informed will face complications and barriers because they have or are trying to farm at a level of intensity that does not suit the environment as determined by the rules. This research believes that through this period of relative uncertainty there will be impact on land values for entities that are farming their resource at an intensity that impacts the environment and who are not applying technologies and better management systems to mitigate that environmental impact. On the flipside land values will be maintained or enhanced for farming entities where land is respected with regard to the rules and to its resource.

It is this researches consideration that MGM will be a significant guide for farmers in Selwyn. It will provide a benchmark by which they farm the resource associated with their property under the farming system they chose to operate.

The unrealised potential of land in Selwyn is under scrutiny. On the whole land values are not being impacted because farmers can continue to operate the same farming system they were running through the baseline period July 2009 to June 2013. Farmers who attempt to realise potential by enacting land use change or intensification to land that is not environmentally suited to that higher intensity are being asked by regional council to assess it, record it and measure it against environmental limits and mitigate; find technology and/or management systems that can improve their impact on the environment. Where limits are still triggered then there will likely be an impact on land value as production is forced to pull

back. This research did not identify any cases where this might occur but it did observe cases where less intensive production was meeting the nutrient limits and land values were perceived to be unaffected.

Overseer is equipping farmers with a tool to measure their impact on the environment and technology in irrigation, effluent, infrastructure and management systems is supporting farmers to farm their desired intensity within the environmental limits. The MGM will provide farmers with a guide on what is acceptable for their resource under their system. The regional rules are set with the health of the catchment in mind, taking into consideration the full amenity of the district, which provides farmers with a bigger picture perspective on how they farm and how that will impact downstream. So the tools, the guide and the rules are available to farmers to farm the land at maximum intensity which is suited to their resource and within acceptable environmental standards for the catchment they do business.

In summary:

- Dairy farmers in Selwyn are generally positive about their ability to farm within nutrient limits, using technology and management systems to mitigate, and maintain, if not, enhance their respective land values.
- The weight of negative perception around the impact nutrient regulation will have on dairy farms located close to Lake Ellesmere is to a degree impacting on the saleability of the farms in this locality. The degree of impact needs to be qualified however because there are other additional factors impacting at the same time and factors accentuating the uncertainty around regulation.
- There are many tools available to farmers, both regulatory and technological, to help them better understand their farming resource and system and enable them to continue to farm productively and profitably in this environment of nutrient regulation, and consequently maintain or enhance land value.

6.1 Limitations of Research

This research is premature with regard to the stage at which the rules are in their rollout. MGM has not yet been published. MGM will define GMP for a farms system, soils and climate and establish a base for the calculation of nitrogen and phosphorous limits that farmers need to be farming at by 1 January 2022. However, the rules and regulation have been developing over an extended period of time and as has been found out, are reasonably well understood by irrigated dairy farms in Selwyn and consequently perceptions have been formed for where the rules are at now, and where they are intended to head. So relative to each case study's circumstances, whether it was a farm purchase, a conversion, trying to sell,

or just farming in the current environment, the research has been able to obtain a good snap shot in time of farmers perception of the impact of nutrient regulation on land value now and a perception of the future. But this research is limited by what has occurred to this point in time and perception of the future in an ever changing regulatory landscape.

This research is limited in its sample size. Eight irrigated dairy farms and their farmers were the focus of this case study. This sample is small and as progress was made through the interviews it was found there were factors arising that would have been good to test across a larger sample. However, due to time constraint the most has been made from what information was gathered.

This research does at least form a base from which future research could explore as the regulation is enforced and tested. The case studies in this research are of irrigated dairy farms. Arable and pastoral farming in Selwyn are impacted by these rules as well, possibly more so. The Central Plains Irrigation Scheme is establishing – stage one is complete and stage two is in design phase. There are implications for landowners in this catchment with potentially large impacts on land value. This would be a good area to research.

Once all the case study's had been completed their validity was contemplated. The level of understanding of each of the interviewees was relatively high. It is considered that there should probably have been more, less informed cases. However one of these case studies had a level of understanding of 5 and it was found that it was very difficult to gain any substance from the interview. There were two farmers contacted who said they knew nothing about the nutrient regulation so thought it would be a waste of time (for themselves and me) to go through the interview and consequently they are not part of this sample. The real power from this research came from the better informed farmers. Their perceptions were well formed on solid information and understanding. Substance was gained from these case studies.

6.2 Further Research

Due to time constraints, this project was necessarily narrow in scope. This research has however highlighted a number of topics which the researcher considers would be worthy of further research:

- Additional research on this topic once the Matrix of Good Management has been published and had time to settle in, once the rules have been put into effect on 1 January 2017 and again after 1 January 2022 when leaching reductions are implemented.
- Research on the impact to non-dairy land uses in Selwyn.

- Research the desire of farmers to continue to farm in a more regulated and compliance focused environment. A subtlety discovered in this research was the negative regard for the level of additional monitoring, recording and reporting that has come about as a result of nutrient regulation and the impact this will have on the human resource that farms in the future.
- Research on the effectiveness and cost-benefit of mitigation practices undertaken on dairy farms using case studies and actual examples.
- Research on the use of incentives as opposed to rules to regulate nutrients.

6.3 Qualifications

During the course of this research Variation 1 of the LWRP has been adopted by council as its decision (23 April 2015) and has been renamed as Plan Change 1. This research has continued to use 'Variation 1' when describing this regulation.

Appendix A - Case Study Summary Table

| | Location (Lower/ Mid/Upper Selwyn) | Demographic | Resource Management | Under- standing 1- 10 | Impact on value now | Mitigation | Impact on land future | Purchasing factors |
|----------|---------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 1 36+ | Burnham, Mid | 154ha, Flat, light soil, \$8m, 580 cows | Red Zone, Irrigation Scheme Baseline 50kgN/ha/yr | 8 | Purchased dryland property with baseline of 50kgN/ha/yr and have converted to dairy with Overseer reading of 44kgN/ha/yr. Nutrient limits was a major focus in finding the right property. Sold dairy farm at Lincoln on heavy soils to be on lighter soils. | Dairy conversion has been undertaken as per GMP including good effluent system, pivot irrigation (from rotorainer). Comfortable future technology, new versions of Overseer, and ongoing testing of the rules would help them be able to maintain productivity and profitability. | Believed their property value would increase in the future. They have ticked all the boxes with their conversion to be a model farm, there was room to move with a high baseline, and they could still put in a feed pad. Considered values in Selwyn would be impacted because of stringent rules as compared to other regions. | 1. Location 2. Water depth 3. Soil 4. Nutrient 5. Shape |
| 2 46+ | Glentunnel, Upper | 324ha, medium rolling, heavy soil, \$10m, 1,050 cows | Red Zone, Phosphorous Zone Baseline 14khN/ha at sale, recently assessed at 44kgN/ha/yr | 5 | Nutrient regulation played a very small part in their decision to purchase their dairy farm. Main driver of purchase was of the ability to lift performance of an underperforming farm. Considered themselves environmentally aware. Do not have a Farm Environment Plan and were not aware of GMP. Also not aware that their farm was in the Phosphorous Sediment Risk Zone. | Since purchasing they moved the location of their effluent spreading to appease neighbours. They have installed a pivot irrigator to moderate rolling hill. They only apply fertiliser behind their cows at the right time climatically. None of these things were necessarily to do with the regulation. Don't believe rules will impact productivity or profitability because they weren't applying much fertiliser. | Believed their property would increase in value because of how they were lifting the fertility of the land. Observation was that they had not considered fully the impact of nutrient regulation. It appeared they thought the regulation was focused on the amount of nitrogen fertiliser applied. | 1. Soil 2. Presentation 3. Irrigation 4. Location 5. Nutrient |
| 3 46+ | Greenpark, Lower | 221ha, flat, heavy, \$7m, 600 cows | Red Zone, Phosphorous Zone, Cultural Zone Baseline 22kgN/ha/yr | 6 | Farm is on the market and is taking a long time to sell. Interviewee believes the rules have had a considerable impact on the value and saleability of their farm because of the perception of the rules and situation to Lake Ellesmere. | Changes to the farm as a result of the rules include a new effluent system, drainage, riparian planting, feed pad. Not much else can be done to fully comply with consents and nutrient regulation. Negatives of nutrient regulation is the level of monitoring and recording. Felt they were losing control of their farm. | Believe the value of their land will decrease and that there is no opportunity as a result of nutrient regulation. | 1. Location 2. Water Cost 3. Shape 4. Soil 5. Labour |

| | Location | Demographic | Resource Management | Understanding 1-10 | Impact on value now | Mitigation | Impact on land future | Purchasing factors |
|----------|-------------------|---------------------------------------|--------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 66+ | Te Pirita, Mid | 325ha, flat, light, \$11m | Red Zone, Irrigation Scheme Area Baseline 35kgN/ha/yr | 9 | A lot of consideration was given to nutrient regulation prior to converting his grazing property to dairy. Sped up the process when had a better understanding of the rules. Specifically focused on how the rules will impact his land. Upskilled on the use of Overseer to help decision making. | Commented that they had done everything possible to mitigate nutrient regulation. Included two pond effluent system, application of effluent through pivots, variable rate irrigation, soil moisture probes, urea applied strategically, maize silage brought in when payout good. Thought there would be no impact on productivity or profitability because they had a good baseline which enabled them to farm the system they chose. | Believes his property is more saleable due to good infrastructure that mitigates the rules. Not planning on doing anything more to mitigate rules. Believes there is strength in being a dairy farmer in Selwyn. The district has a very large infrastructural investment in dairy providing strength to its ability to challenge rules if they aren't working. | 1. Location/Enterprise 2. Water 3. Soils 4. District/Regional Council 5. Zone Regulations |
| 5 46+ | Motukarara, Lower | 184ha, flat, heavy soils, \$42,000/ha | Red Zone, Cultural Zone. Baseline 22kgN/ha/yr | 8-9 | Having trouble selling their property due to a general lack of understanding of the rules. Acknowledged the property could do with more spent on things to mitigate regulation but annoyed there is no improvement to productivity or profitability as a result of the high capital expense. | Spending \$5,000 per year on riparian planting, new effluent system has been installed, new effluent spreading system has been installed. Management changes include calving on another block, use of maize as a supplement but this is being superseded with fodder beet. Believed the changes made to the farm would increase the value. | Believed there would be more scrutiny of farm systems and their impact in Overseer which will in turn impact on land values. | 1. Location/School 2. Water 3. Climate 4. Shape 5. Altitude |
| 6 55+ | Leeston, Lower | 210ha, flat, heavy soils | Red Zone Phosphorous Zone Baseline 11kgN/ha/yr | 8 | Considers his land is at an advantage having a baseline of 11 kgN/ha/yr which is under the 15 kgN/ha/yr limit. | Planting and new effluent system. Moisture probes put in. Believes recording and reporting is one of the negative impacts of the rules. Enforcement might be a negative but not at that point yet. | Believes no impact on his land value because he has room to move with his baseline. Grew up in an environment of fewer rules. Too much compliance now with recording onerous. | 1. Nutrient baseline 2. The lands ability to take the system I want to apply 3. Is it a farm that could create problems – future risk from a regulatory perspective? 4. Infrastructure on farm 5. Location, shape and soils. |

| | Location | Demographic | Resource Management | Under-standing 1-10 | Impact on value now | Mitigation | Impact on land future | Purchasing factors |
|----------|----------------|---------------------------------------|------------------------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 7 26+ | Te Pirita, Mid | 4200ha, flat, light soils. | Red Zone, Irrigation Scheme Baseline 53kgN/ha/yr | 9 | Considers no impact to date. Under dairy through baseline period so freedom to farm as they were. LWRP allows for multi landholding consent (enterprise) which will provide ability to move nutrients around. | Fodder beet instead of kale, Sustain N Fertiliser, no May application, not pushing the stocking rate, focused on good irrigation systems, keeping accurate records, feed pad put on one farm, good R&M practices, effluent spreading, and moisture probes put in. Didn't see any benefits other than team a bit better informed. Main negative is the amount of recording. | Waiting to find out what GMP will be. It is up to the ability and desire of farmers to invest in infrastructure and systems to mitigate rules as to whether rules will impact on land value. | 1. Nutrient 2. Irrigation Potential 3. Soil – history, fertility 4. Connectivity - tech 5. Topography |
| 8 46+ | Lincoln, Lower | 177ha, flat, heavy soils, \$48,000/ha | Red Zone Haswell Catchment Baseline 19kgN/ha/yr | 8 | Purchased at peak of uncertainty. Only upside to come. Nutrient regulation impacted on decision to purchase heavier soils. Lifestyle use underpins value in this location. Believes values have been impacted in the Lake area as a result of the rules and was able to purchase land at a better price because of the rules. | Moisture probes only physical mitigation since purchase. Fertiliser application timing a focus. Jersey cows milked. Farm is well set up with effluent system, small feed pad, and good drainage. Gains to be made with irrigation, position of shed. No impact on productivity or profitability or land value. Focused on rules, environment secondary. | Investigating the benefits of enterprising his landholding and believes there is real opportunity with this to enable him to expand. | 1. Ability of the land to grow grass 2. Compliance 3. Location 4. Soils 5. Opportunity |

Appendix B - LWRP Nutrient Management Rules

How the rules apply (Canterbury Summary, Feb 2014): Small farms (less than 5ha), or farms leaching less than 10kg/ha (outside a Lake Zone), are a permitted land use. Farms operating in an irrigation scheme or under a principal water supplier are a permitted land use provided their scheme or supplier holds a resource consent that meets the Land & Water Regional Plan rules. Farms that aren't authorised by either of the above rules must be assessed against the coloured zone rules (see below and over the page) to determine whether their land use is permitted or requires a resource consent. All farms larger than 5ha must establish a nitrogen baseline. The baseline is the average nitrogen loss below the root zone from 1 July 2009 to 30 June 2013. All farms requiring a resource consent must prepare a farm environment plan as part of their consent application. If such a plan is not prepared the activity has a non-complying status, and these consents are granted in exceptional circumstances only.

There are different rules in each nutrient zone as follows (Canterbury Summary, Feb 2014):

Red zones - within a red zone there can be no increase in nitrogen leaching beyond the leaching baseline. Farms with medium nitrogen leaching rates in the red zone (less than 20kg/ha/yr) can continue to operate as a permitted activity. Farms with higher leaching losses (more than 20kg/ha/yr), can continue to operate until 1 January 2017, but after this date a resource consent is required and a completed Farm Environment Plan is an essential component of any application for consent.

The Lake Zone catchments are sensitive to nutrient enrichment, so increases in nitrogen leaching must be avoided. Any increase in nitrogen leaching against the nitrogen baseline is a prohibited activity. It is a permitted activity if the farm is smaller than 5ha. Resource consent and farm environment plan required if leaching is more than 10kg/ha/yr.

Orange zone - in the orange zone, small increases in nitrogen leaching (increases less than 5kg/ha/yr) are permitted until 1 January 2016. After this date, farms which continue to limit their leaching losses to 20kg/ha/yr will continue to be permitted activities, while farms with higher leaching losses (more than 20kg/ha/yr) will require a resource consent if the farm is larger than 50ha, or if the nitrogen leaching losses increase. A completed Farm Environment Plan is an essential component of any application for consent.

Green/light blue zone - in the green/light blue zone, farms with medium nitrogen leaching rates (less than 20kg/ha/yr) can continue to farm as a permitted activity, provided information about the farm (for example stocking rates, irrigation management, yield, effluent management) and nutrient budgets are kept. For farms with higher nitrogen leaching losses (more than 20kg/ha/yr) a resource consent is required if the property is larger than 50 hectares in area and the nitrogen leaching losses increase by more than 5kg/ha/yr. A completed Farm Environment Plan is an essential component of any application for consent.

LWRP Zone Map

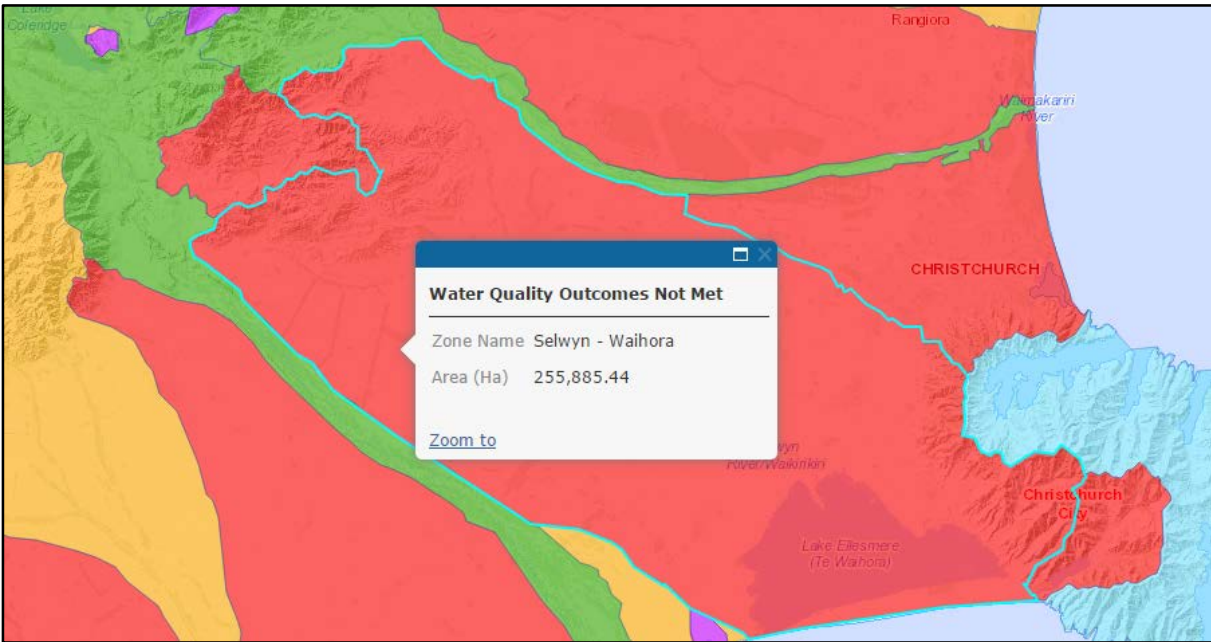


Figure 10: LWRP Zone Map - Source: Canterbury Maps

Zone Map for Selwyn under Variation 1:

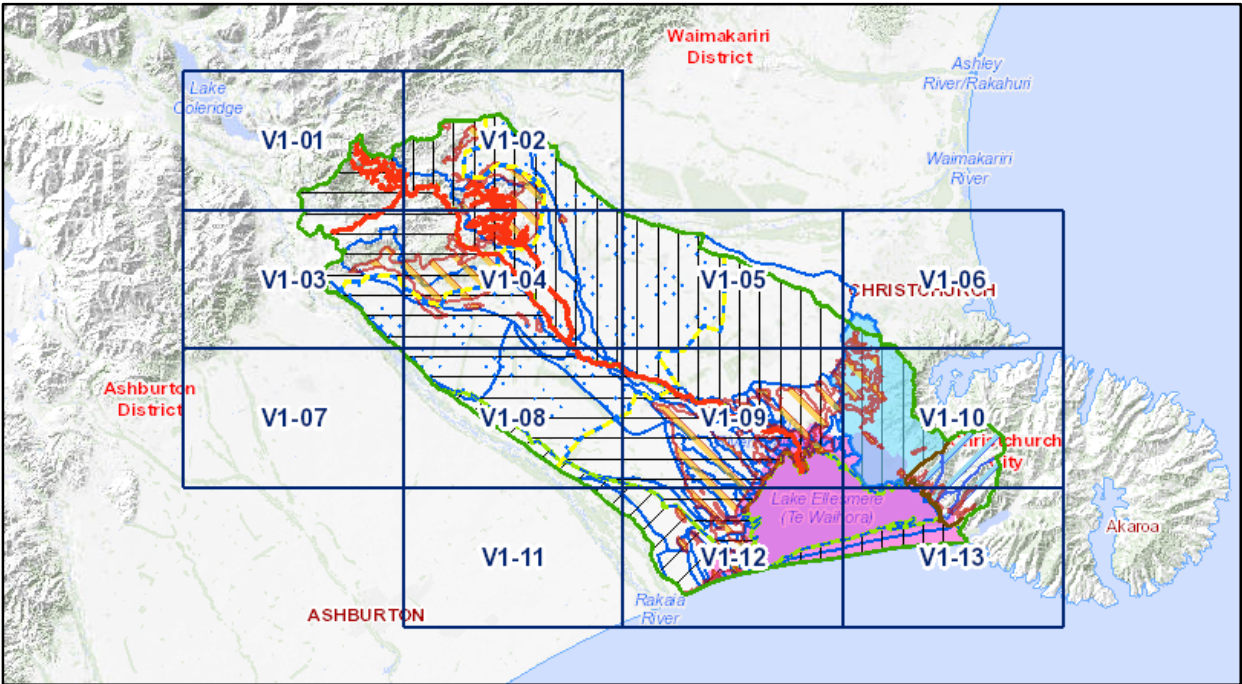


Figure 11: Selwyn under Variation 1 - Source: Canterbury Maps

Appendix C - Interview Guide

Structured Questions

| | |
|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Interviewee's Role: | |
| Age: (please circle) | (15-25) (26-35) (36-45) (46-55) (56-65) (66-100) |
| Property Ownership Structure: | |
| Location: | |
| | |
| Land Area (legal/effective): | |
| Property Description: (contour, situation, location, soils, nutrient zone, phosphorous sediment risk area, heritage area, irrigation scheme) | |
| Description of Infrastructure: (dairy shed type and capacity, wintering barn, feed pad, calving shed, dwellings) | |
| Irrigation: (area, type, other) | |
| Description of Management System: (wintering, milking regularity, supplementary feed made/brought in) | |
| Number of Cows & Breed: | |
| | |
| | |

| | | | | | | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|----|
| When was the property sold/purchased: | | | | | | | | | |
| Purchase/Sale Price: | | | | | | | | | |
| Property Value: | | | | | | | | | |
| Total annual milk solids produced: | | | | | | | | | |
| Total Turnover 2014/15: | | | | | | | | | |
| Operating expenses excl. interest, incl. management: | | | | | | | | | |
| | | | | | | | | | |
| Does the property have a Farm Environmental Plan? What has been done to your farm as a result of the plan: | | | | | | | | | |
| Has Good Management Practice been implemented – to what extent? | | | | | | | | | |
| What is the property N Baseline (2009-2013)? How has it changed since 2009-2013? | | | | | | | | | |
| What do you consider your level of understanding of the nutrient rules in the LWRP and variation 1 is - (1 = have no understanding, 10 = excellent understanding): | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| What do you understand about your requirements in 2017 and 2022? | | | | | | | | | |

Semi Structured Questions

1. Perception of whether nutrient regulation is having an impact on land values now:
 - a. How much consideration have you given to the Land & Water Regional Plan nutrient regulations (including Variation 1) with respect to:
 - i. The purchase of your property or;
 - ii. The sale of your property or;
 - iii. The saleability of your property
 - b. What did/would you specifically consider? Why?
 - c. Do you think there has been any impact on the value of your land given the introduction of nutrient regulation? Based on what?
2. Have you taken any action to mitigate nutrient regulation:
 - a. What physical changes have been made on farm since the introduction of nutrient regulation i.e. new buildings, feed pads?
 - b. Have there been any changes made to the management of the property as a result of nutrient regulation? If so, what?
 - c. What have been the benefits of these changes?
 - d. What have been the negative effects of these changes?
 - e. How do you envisage the rules will impact your farms productivity?
 - f. How do you envisage the rules will impact your farm businesses profitability?
 - g. What is the likely effect on the value of your property from each of these?
 - i. Physical changes
 - ii. Management changes
 - iii. Productivity
 - iv. Profitability
3. How nutrient regulation might be considered with regard to the future use and/or the future purchase/disposal of your land.
 - a. What will you consider when making any future land acquisitions/disposals with regard to nutrient rules? Why?
 - b. With the introduction of nutrient regulation are you planning to do more to protect the value of your asset? What? How?
 - c. What do you perceive the impact will be on the value of your land in the future as a result of nutrient regulation?

Increase Land Value Decrease Land Value Make no difference

- d. Why?
 - e. How do you perceive nutrient regulation will impact on land values in Selwyn-Waihora?
 - f. What are the impacts to you of entering a more regulated environment (as discussed) when there is volatility in the market?
4. Purchasing a property:
- a. What are the top five things you would now consider when purchasing a farm?
 - b. With the addition of nutrient regulation how would you rank them?

Appendix D - Research Information Sheet

| |
|--------------------------------------------|
| Lincoln University Policies and Procedures |
|--------------------------------------------|

Lincoln University

Faculty, Department or Research Centre: Commerce

Research Information Sheet

You are invited to participate as a subject in a project entitled

**The impact of nutrient regulation on land values in the Selwyn
Waihora Water Management Zone, Canterbury.**

The aim of this project is to understand how stakeholders in land in the Selwyn-Waihora Water Management Zone are considering the nutrient regulation in relation to the value of their landholding. The objective is to have open discussion with landowners in the Selwyn Waihora Water Management Zone to gauge how much of an impact the regulation might be having on land values now and how much of an impact they are perceived to have in the future as the rules come into force. That is whether they considered the impact of regulation in their sale or purchase decision, whether they are taking action now to mitigate any perceived impact, and whether they perceive regulation will impact on their future use and/or disposal of their land. Ultimately this research hopes to answer this question - "what impact is nutrient regulation having or likely to have on the value of farmland in the Selwyn Waihora Water Management Zone in Canterbury.

This research is a student project part of a Master's Degree programme being undertaken at Lincoln University and will be supervised by a Lincoln University staff member.

Your participation in this project will involve an interview to be undertaken at an agreed location convenient to you and will take 1 to 2 hours. It would be good to be able to record the interview so that the interviewer does not need to write notes through the interview.

The type of questions include questions about the physical property, its management, the purchase/sale price of the property and its performance. Questions about the productive capacity and farm expenses before interest will be asked. Otherwise the questions will follow a theme of your perception of how nutrient regulation rules have, are and will impact on the value of the land you are either purchasing or selling.

You have been approached to be involved in this study because you either have a dairy farm for sale, have recently purchased a dairy farm or run a dairy farming entity which is actively involved in the sale and/or purchase of dairy farms.

The results of the project may be published, but you may be assured of your anonymity in this investigation: the identity of any participant will not be made public, or made known to any person other than the researcher, his or her supervisors and the Human Ethics Committee, without the participant's consent. You will have total anonymity and will not be identified in the research paper which means your name(s), property name(s), property address(s) will not be used in the research. Instead you will be coded from 1 to 8 and categorised into either the Lakes Area, Mid Selwyn or Upper Selwyn depending on the location your farm is located.

The project is being carried out by:

Edward Percy
E. edward.percy@gmail.com **M.** 0276525474

He will be pleased to discuss any concerns you have about participation in the project.

Name of Supervisor:

Dr Gary Garner
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The project has been reviewed and approved by the Lincoln University Human Ethics Committee.

Appendix E - Telephone Script

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|--------------------------------------------|
| Lincoln University Policies and Procedures |
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Telephone Script

Name of Project: The impact of nutrient regulation on land values in the Selwyn Waihora Water Management Zone, Canterbury.

Hello, my name is Edward Percy. I am a postgraduate student completing a Masters in Property Studies at Lincoln University in the Commerce Faculty.

You are invited to participate in a project that aims to understand the perception of dairy farmers in the Selwyn-Waihora water management zone on the impact of nutrient regulation on land values.

I was provided your contact details from.....

Your participation in this research will involve a 1 to 2 hour interview with questions about your dairy farm including questions about the physical characteristics of the farm, the management and the productivity.

Participation in the research is voluntary and you may decline to answer questions or withdraw at any point prior the completion of this research at the end of November.

If you do withdraw at any stage, any information you have already provided will be destroyed.

All information will remain confidential to me as researcher and my supervisor(s).

Are you prepared to participate in this research project?

When would be a good time for me to meet with you and where would it be convenient for you?

Thank you for your time. If you have any questions regarding this research, please contact:

Name of researcher Edward Percy

Telephone number 0276525474

or my supervisor(s)

Full name(s) of supervisor(s)

Telephone number(s) of supervisor(s).

Note: details to be provided if supervisor(s) are involved in the project.

Appendix F - Consent Form

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|--------------------------------------------|
| Lincoln University Policies and Procedures |
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Consent Form

Name of Project: *The impact of nutrient regulation on land values in the Selwyn-Waihora Water Management Zone, Canterbury*

I have read and understood the description of the above-named project. On this basis I agree to participate as a subject in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved. I understand also that I may at any time withdraw from the project, including withdrawal of any information I have provided, up to the end of October 2015 when the researcher will be submitting his research.

I also agree to having the interview recorded with the understanding that the recording will be deleted at the conclusion of the project at the end of October 2015.

Name: _____

Signed: _____ Date: _____

7 - References

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